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TWENTY-FIRST ANNUAL REPORT

OF THE

UNITED STATES GEOLOGICAL SURVEY

TO THE

SECRETARY OF THE INTERIOR

1899-1900

CHARLES D. WALCOTT
DIRECTOR

IN SEVEN PARTS

PART I.—DIRECTOR'S REPORT, INCLUDING TRIANGULATION, PRIMARY TRAVERSE, AND SPIRIT LEVELING

WASHINGTON
GOVERNMENT PRINTING OFFICE
1900

TWENTY-FIRST ANNUAL REPORT

OF THE

UNITED STATES GEOLOGICAL SURVEY

PART I.—DIRECTOR'S REPORT, INCLUDING TRIANGULATION, PRIMARY TRAVERSE AND SPIRIT LEVELING

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LETTER OF TRANSMITTAL.

Department of the Interior,
United States Geological Survey,
Washington, D. C., August 18, 1900.

Sir: I have the honor to transmit herewith a report of the operations of the United States Geological Survey for the year ending June 30, 1900.

In this connection permit me to thank you for the continued active and helpful interest you have manifested in the work of the Survey.

I am, with respect,
Your obedient servant,

Chas. D. Walcott,
Director.

Hon. E. A. Hitchcock,
Secretary of the Interior.

TWENTY-FIRST ANNUAL REPORT OF THE UNITED STATES GEOLOGICAL SURVEY.

CHARLES D. WALCOTT, DIRECTOR.

INTRODUCTION.

The work of the Geological Survey during the fiscal year 1899–1900 was mainly a continuation of that of previous years, described in former reports. The same organization was maintained (see p. 61) and in a general way similar results were reached, which added materially to the sum of geologic and geographic knowledge. The detailed record of accomplishment, both in field and in office, will be found on later pages under the heading "Work of the year" (p. 65). In this introduction a few subjects of special interest will receive consideration.

FOREST RESERVES.

The survey of the forest reserves has advanced as rapidly as possible during the short periods of time in which such work could be carried on in these mountainous regions. In connection with the preparation of a topographic map, which is preliminary to a forestry map, 21,540 square miles have been surveyed within the reserves, and 10,759 square miles in areas immediately adjacent to the reserves, which may at some future time be included within them, or to which they are tributary, providing timber or water supply. The area triangulated within and adjacent to the reserves to date is 47,867 miles. As most of the reserves were practically a wilderness in which no land lines or astronomic or triangulation points had been established, it was necessary to begin the mapping by providing a thorough system of triangulation. The following is a statement of the work done in surveying and marking the boundaries and in the topographic mapping of the areas.

Progress of Topographic and Boundary-Line Surveys.

CALIFORNIA RESERVES.

San Gabriel Timber-Land Reserve.—The triangulation of this reserve has been completed, and two-thirds of the area has been mapped. In addition, about 400 square miles have been mapped in forested areas adjacent to the reserve. Of land surveys, 49 miles of section lines have been run and 4 miles retraced.

Sierra Reserve.—About 1,000 miles of this reserve have been triangulated and 75 square miles mapped. Adjacent to the reserve, 5 miles of township lines, 2 miles of section lines, and 1 mile of retracement have been run.

San Bernardino Reserve.—This reserve has been entirely triangulated and surveyed, and, in addition, about 470 miles of adjacent area have been mapped.

Trabuco Canyon Reserve.—The entire area included in this reserve has been mapped.

San Jacinto Reserve.—Nearly one-half of this reserve has been mapped and also 500 miles of adjacent territory.

Pine Mountain and Zaca Lake Reserve.—About 100 miles have been triangulated, and 10 square miles have been mapped.

BITTERROOT RESERVE, MONTANA-IDAHO.

The entire area of this reserve has been triangulated, and there have been mapped about 500 square miles within the limits of the reserve and 500 square miles adjacent to it. Of land lines there have been surveyed linear miles as follows: Standard lines, 21; township lines, 42; section lines, 21; retracement, 2; meander, 6. Reconnaissance maps of the entire area have been prepared.

PRIEST RIVER RESERVE, IDAHO.

About one-half of this reserve has been triangulated and one-fourth mapped. In addition, about 750 miles of adjacent territory have been mapped. Of land lines, 30 miles of standard and 24 miles of township lines have been surveyed. Reconnaissance maps of the entire area have been prepared.

CASCADE RANGE RESERVE, OREGON.

Twenty-eight miles of subdivisional surveys have been run in a township adjacent to this reserve.

WASHINGTON RESERVES.

Washington Reserve.—Somewhat over one-half of this reserve has been triangulated and about one-third has been topographically mapped. In addition, about 3,500 square miles have been mapped in territory immediately adjacent. Reconnaissance maps of the entire area have been completed.

Olympic Reserve.—No triangulation or detailed topographic work has been executed within the limits of this reserve. A reconnaissance map of three-fourths of the reserve has been made.

Mount Rainier Reserve.—More than one-half of the area of this reserve has been triangulated and about 150 square miles have been topographically mapped. In addition, there has been mapped an area of nearly 2,000 miles adjacent to the reserve. A reconnaissance map of the entire reserve has been prepared.

BLACK HILLS FOREST RESERVE, SOUTH DAKOTA-WYOMING.

The topographic and land-classification maps of this reserve have been completed; 1,893 square miles within the reserve and 832 square miles adjoining have been surveyed, making a total of 2,725 square miles on account of forestry appropriation. Of land lines, 118 miles of standard and township lines have been surveyed and 43 miles of resurveys or retracements, a total of 161 miles; and 1,304 miles of subdivisional surveys have been run. These include surveys in 40 townships. In addition to this, 217 miles of the reserve boundary line, including the Deadwood Exemption, have been surveyed and marked by special iron posts, leaving 23 miles of line in Wyoming still to be marked.

BIGHORN FOREST RESERVE, WYOMING.

The topographic and land-classification maps have been completed. There have been surveyed within the reserve

1,762 and of adjoining land 638 square miles, making a total of 2,400 square miles. No land-survey work has been attempted for this reserve.

TETON RESERVE, WYOMING.

The topographic and land-classification maps have been completed. There have been surveyed 1,296 square miles within the reserve and 496 square miles adjoining it, making a total of 1,790 square miles. For this and the Bighorn Reserve and the Yellowstone Park Timber Reserve an area of about 12,000 square miles has been covered by triangulation, the three reserves being connected thereby.

UINTA RESERVE, UTAH.

The entire reserve and considerable of the surrounding area have been covered by triangulation, the total area completed being approximately 5,000 square miles. Topographic and land-classification maps have been completed for 125 square miles within the reserve and for 675 miles adjoining the reserve, making a total of 800 square miles.

LEWIS AND CLARKE RESERVE, MONTANA.

A reconnaissance topographic timber plat has been made for the whole reserve, including an area of 4,570 square miles. Reconnaissance for triangulation has been extended over about 3,000 square miles. No detailed topographic sketching has been undertaken as yet. Land-survey work has been carried on in four townships, for which 31 square miles of exterior or standard lines, including 6 miles of retracements, and 104 miles of subdivisional lines have been run.

FLATHEAD RESERVE, MONTANA.

Triangulation has been completed for about 1,200 square miles within or adjoining this reserve. No detailed topography has as yet been undertaken.

SUMMARY.

Thus, out of an area of 71,697 square miles, 21,540 square miles have been surveyed and mapped, and in addition 10,759 square miles outside of but adjacent to the reserves; and of the boundary lines of the reserves 2,052 miles have been run. The results are shown in the following table:

Areas of forest reserves and areas surveyed by United States Geological Survey to March, 1900.

State or Territory.	Reservation.	Total area.	Area triangulated within and adjacent to reserve.	Area surveyed within reserve.	Area surveyed adjacent to reserve.	Land lines surveyed.
		Sq. miles.	*Sq. miles.*	*Sq. miles.*	*Sq. miles.*	*Lin. miles.*
Arizona	Grand Canyon	2,893		2,893		
	San Francisco	1,524		1,524		
	Black Mesa	2,592		1,000		
	Prescott	16		16		
California	San Gabriel	868	868	615	400	53
	Sierra	6,400	1,000	75		8
	San Bernardino	1,152	1,152	1,152	470	
	Trabuco Canyon	172	172	172		
	Stanislaus	1,080		900		
	San Jacinto	1,152	1,152	480	500	
	Pine Mountain and Zaca Lake.	2,570	100	10		
Colorado	White River Plateau	1,872				
	Pikes Peak	288		288		
	Plum Creek	280		242		
	South Platte	1,068		489		
	Battlement Mesa	1,341				
Idaho and Montana.	Bitterroot	6,480	6,480	500	500	92
Idaho and Washington.	Priest River	1,008	1,500	260	750	54
Montana	Gallatin	63		63		
	Flathead	2,160	1,200			
	Lewis and Clarke	4,572	3,000			135
New Mexico	Pecos River	674		470		
	Gila River	3,636				
Oregon	Bull Run	222				
	Cascade Range	7,020		1,200		28
	Ashland	29		29		
South Dakota and Wyoming.	Black Hills	1,893	2,000	1,893	832	1,682
Utah	Uinta	1,368	3,000	125	675	
	Fish Lake	106	1,243			
Washington	Washington	5,616	11,000	2,000	3,500	
	Olympic	3,420				
	Mount Rainier	3,168	2,000	150	2,000	
Wyoming	Yellowstone	1,936		1,936		
	Bighorn	1,762	12,000	1,762	638	
	Teton	1,296		1,296	494	
	Total	71,697	47,867	21,540	10,759	2,052

Examination of Timber.

The examination of the timber upon the reserves with a view to learning its amount, distribution, character, and its value for various purposes, together with the study of the best methods of administration in the present and future interests of the people, has been advanced in the several reserves as follows:

Black Hills Reserve, South Dakota.—Area 1,893 square miles; examination completed and report published.

Bighorn Reserve, Wyoming.—Area 1,762 square miles; examination completed and report published.

Teton Reserve, Wyoming.—Area 1,296 square miles; examination completed and report published.

Yellowstone Park Reserve, Wyoming.—The portion of this reserve lying south of the Yellowstone National Park, comprising an area of about 500 square miles, has been examined and reported upon and the report has been published.

Flathead Reserve, Montana.—Area 2,160 square miles; examined, report prepared and published.

Lewis and Clarke Reserve, Montana.—Area 4,572 square miles; examined, report prepared, now in manuscript.

Bitterroot Reserve, Idaho-Montana.—Area 6,480 square miles; examined, report prepared and published.

Priest River Reserve, Idaho-Washington.—Area 1,008 square miles; examined and report published.

Washington Reserve, Washington.—Area 5,616 square miles; examined, report prepared and published.

Olympic Reserve, Washington.—Area 3,420 square miles; two-thirds of area examined, report prepared and in manuscript.

Mount Rainier Reserve, Washington.—Area, including Mount Rainier National Park, 3,492 square miles; examined, report prepared and now in manuscript.

Cascade Reserve, Oregon.—Area 7,020 square miles. The southern portion of this reserve, together with adjacent territory, embracing some 8,000 square miles, has been examined and the report has been prepared and is in manuscript.

Ashland Reserve, Oregon—Area 29 square miles; examined, report prepared and now in manuscript.

Pikes Peak Reserve, Colorado.—Area 288 square miles; examined, report prepared and published.

Plum Creek Reserve, Colorado.—Area 280 square miles; examined. report prepared and published.

South Platte Reserve, Colorado.—Area 1,068 square miles; examined, report prepared and published.

White River Plateau Timber-Land Reserve, Colorado.—Area 1,872 square miles; examined, report prepared and published.

Battlement Mesa Reserve, Colorado.—Area 1,341 square miles; examined, report prepared and published.

Stanislaus Reserve, California.—Area 1,080 square miles; examined, report prepared and now in manuscript.

Yosemite National Park.—Area 1,512 square miles; examined, report prepared, in manuscript.

San Jacinto Reserve, California.—Area 1,152 square miles; examined, report prepared and published.

San Bernardino Reserve, California.—Area 1,152 square miles; examined, report prepared and published.

San Gabriel Reserve, California.—Area 868 square miles; examined, report prepared and published.

The total area of lands reserved under the forest reserve act, together with the Mount Rainier and Yosemite National Parks, is approximately 72,800 square miles. Of this area, examinations have been made of 42,200 square miles, as appears from the above, leaving as the area not yet examined 30,600 square miles. In other words, examinations have been made of 58 per cent of the total area. Besides this, examinations have been made of many and large areas adjacent to the reserves, with a view to their possible inclusion in the reserved areas.

ALASKA.

The exploration in Alaska as outlined in the last report was carried forward successfully, the surveys being completed without any serious accident. A detailed report of the operations will be found on pages 145–149.

In the latter part of April, 1900, four parties left for Alaska. The first received instructions to proceed to the Chitina River region of the Copper River district. Reports from the officers of the Geological Survey and the military surveying parties, as well as from private sources, indicate the existence of a probably important copper district on the tributary of Copper River near the Chitina, south of the Wrangell Alps, and also on the headwaters of the Copper and Nabesna rivers north of that mountain range.

The most important work to be done in Alaska was the detailed topographic and geologic survey of the Cape Nome district and its extensions in Seward Peninsula. Surveys were planned, according to the best information available, to define the extent of the gold-bearing area in the southern portion of Seward Peninsula between Cape Nome and Fish River, an area between 3,000 and 4,000 square miles in extent. For this survey one topographic and one geologic party were organized.

The fourth party was organized to make a reconnaissance of the extension of the Nome gold belt and to survey the northeastern portion of Seward Peninsula, returning across the neck of the peninsula by Buckland River to Norton Bay.

Preparations for exploration in 1901 were also made by establishing a supply camp at the mouth of Allen River. The proposed route of the party is via the Allen to the divide at which it heads, thence to streams flowing north to the Arctic Ocean, down some such stream to the Arctic, and along the coast westward and southward until the party shall be picked up. It is necessary to provide a year in advance for such an expedition, because it is impracticable for a party loaded with supplies for a season's work to leave Washington and reach the Upper Koyukuk sufficiently early in the season to be assured of adequate results, with certainty of escape in the autumn.

HYDROGRAPHIC WORK.

The demand from all sections of the country for an increase of the hydrographic work of the Survey resulted in an increase in the appropriation for the fiscal year 1900–1901. This demand comes not only from the arid and semiarid regions of the West, where water is the all-important factor in the development of the intermontane States, but also from the Appalachian and New England regions, where the subject of water power is of great importance, and from the Mississippi Valley and Gulf States, where a supply of pure water for domestic use is of the greatest importance to the health and prosperity of the people. If the numerous applications and requests for hydrographic work are to be complied with even passably, a large increase in the appropriation will be necessary for the fiscal year 1902.

REORGANIZATION OF GEOLOGIC BRANCH.

In view of the increase of appropriations for the fiscal year 1900-1901, a reorganization of the Geologic Branch seemed advisable. The new organization was approved by the Secretary of the Interior, and went into effect July 1, 1900. As the change was conceived, considered, and made within the year to which this report pertains, an outline thereof seems not inappropriate in this place.

In the early organization of the Survey administrative regulation and scientific direction of geologic work were united in chiefs of large geographic divisions, of which the Atlantic Coast division, the Appalachian division, and the California division were examples. The geologist in charge of such a division had, under the Director, entire control of the administrative as well as of the scientific work within his province. His assistants reported to him, and not, as a rule, immediately to the Director. In the eleventh year of the Survey's history Mr. G. K. Gilbert was appointed chief geologist, and on his withdrawal from administrative duties, three years later, Mr. C. D. Walcott was made geologist in charge. After fifteen years' trial the system of geographic provinces was abolished (in 1893), because it was found to involve excessive cost of administration. Furthermore, the purview of the geologist in charge being officially no broader than that of the geologists under his direction, their fields of scientific work were practically coincident, and any distinction as to the subjects which either might treat scientifically was necessarily along artificial and debatable lines. That these conditions did not lead to serious differences of purpose was due to the broad-mindedness of the geologists placed in charge.

Upon the abolition of geographic provinces a tentative organization by parties was established. Under this arrangement, followed since 1893, each geologist reported to the Director, both administratively and scientifically. This threw upon the

Director the immediate responsibility for the coordination of diverse views upon scientific questions, as well as for the adjustment and approval of plans of operation. With the development of the Survey the burdens of the Directorship became more varied and onerous, and an assistant was appointed to relieve him of routine details in the Geologic Branch. This assistant was also instructed to exercise such supervision as might be possible over the field and office work in general, to promote agreements on controverted questions before publication, and to prevent the overlapping of the work of different parties.

Under this arrangement there arose the necessity for occasional and temporary appointment of a specialist in one branch of geology or another, whose duty it was to bring together in the field geologists having diverse views, and through investigation and discussion to establish unity of opinion upon the basis of facts. Perhaps the most important service of this character has been rendered by Prof. C. R. Van Hise in connection with the extremely difficult problems of the metamorphic rocks of eastern United States. Other specialists have had charge of other subjects in more or less restricted provinces. For example, Prof. T. C. Chamberlin has directed the study of the glaciated regions; Mr. S. F. Emmons has had supervision of the investigations of metalliferous deposits in the Rocky Mountain region; and in paleontology grand divisions have been assigned to specialists particularly qualified to treat them broadly. This practice led to the suggestion of a reorganization which would meet the growing need of closer and permanent supervision in scientific lines. After careful consideration the Geologic Branch was subdivided and each division placed in charge of a specialist, as follows:

Division of Areal Geology.

(Stratigraphy, structure, and pre-Pleistocene physiography.)

BAILEY WILLIS, GEOLOGIST IN CHARGE.

Divisions immediately cooperating: Paleontology; Pleistocene Geology, in relation to areal distribution; pre-Cambrian and Metamorphic Geology, in relation to areal distribution; Hydrography, in relation to stratigraphic and areal distribution of underground waters; Economic Geology, in relation to areal distribution of mineral deposits.

Division of Pleistocene Geology.

(Glacial and nonglacial formations and Pleistocene physiography.)

T. C. CHAMBERLIN, GEOLOGIST IN CHARGE.

Divisions immediately cooperating: Areal Geology; Economic Geology; Paleontology; Hydrography.

Division of Paleontology.

(Executive administration of relations of the division.)

T. W. STANTON, PALEONTOLOGIST IN CHARGE.

Divisions immediately cooperating: Areal Geology; Pleistocene Geology.

Division of Pre-Cambrian and Metamorphic Geology.

(Structure, metamorphism, and genesis of crystalline schists and associated rocks, including the metamorphic iron ores.)

C. R. VAN HISE, GEOLOGIST IN CHARGE.

Divisions immediately cooperating: Areal Geology; Economic Geology.

Division of Mining and Mineral Resources.

(Distribution and production of economic minerals.)

D. T. DAY, GEOLOGIST IN CHARGE.

Divisions immediately cooperating: Economic Geology; Hydrography.

Division of Economic Geology.

S. F. EMMONS, GEOLOGIST IN CHARGE OF SECTION OF METALLIFEROUS ORES.

C. W. HAYES, GEOLOGIST IN CHARGE OF SECTION OF NONMETALLIFEROUS ECONOMIC DEPOSITS AND NONMETAMORPHIC IRON ORES, BAUXITE, ETC.

Divisions immediately cooperating: Areal Geology; Pleistocene Geology; Pre-Cambrian and Metamorphic Geology; Mineral Resources; Hydrography.

Division of Physical and Chemical Research.

GEORGE F. BECKER, GEOLOGIST IN CHARGE.

The field of supervision of each geologist in charge is coextensive with the work of the Geological Survey, and relates to all parties engaged in work connected with his special subject. His assistance in field or office work may appropriately be offered or invited. His opinion should be considered authoritative in subjects under his supervision, and his approval of any report may be required. This authority, however, is restricted to the scientific aspects of the work. Administrative direction remains, as heretofore, in the hands of the Director, who will authorize the execution of plans of operations after full consideration and conference upon estimates submitted by geologists in charge of parties.

Under the new organization every geologist is at liberty to make full use of the facts which he observes within his field of operations, the geologist in charge of any particular subject to be duly credited with the supervision he may have exercised. For the geologists in charge the plan affords an opportunity to study a special subject in all its aspects throughout the field of operations of the Survey, either directly by personal observation or indirectly by conference with associates.

DIVISION OF MINES AND MINING.

In the Twentieth Annual Report of the Survey reference was made to the establishment of a Division of Mines and Mining. During the year advance was made in the development of economic work, and an organization has been effected which gives to all intents and purposes a Division of Mines and Mining, but it is not yet established by statute.

A brief outline of the work of the Survey in relation to the mineral resources of the United States will show what has been accomplished during the first twenty years of its existence.

Work of the Survey in Relation to Mineral Resources.

The organic law of the Geological Survey provides that its Director "shall have the direction of the geological survey, and the classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain."

Under these broad general provisions, the first Director, Clarence King, laid out a comprehensive plan of operations in the States west of the one hundred and second meridian. Of this he said:[1]

> There can hardly be two opinions on the desirableness of immediately working out such problems in these great districts which, in their past and present history, offer examples of instructive geological structure and great bullion-yield, and which have required of mining men special mechanical skill and large outlay of capital. Proper scientific reports on such typical districts become records of remarkable phenomena in

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[1] First Ann. Rept., U. S. Geol. Survey, 1880, p. 8.

the field of industrial geology and chronicles of distinguished success in the department of mining engineering. Among the great numbers of mining districts which merit rigid investigation I have chosen three, which more than others seemed to offer harvests of technical information, of which the mining population stands in immediate need. Leadville, the extraordinary district in middle Colorado; Eureka, Nevada, which for fifteen years has been the most productive silver-lead district in America; and the incomparable Comstock Lode, are chosen as the first three districts to be illustrated by special monographs.

All of these investigations were completed, and the reports were published, after Mr. King resigned the Directorship of the Survey in 1881.[1]

His successor, Director Powell, was confronted with the problem of the extension of the survey over the entire United States and the examination of the mineral resources of the country. Plans were formulated for the investigation of the copper and iron deposits of the Lake Superior region, the iron and coal deposits of the Appalachian area south of the Potomac, the phosphate deposits of Florida, and many minor areas of economic interest. Maps suitable as a basis for geologic and mining work were not in existence. Year after year the topographic survey was pushed ahead, the geologic work being limited to the regions of which maps were available. For the mining engineer it was a long, tedious period of waiting, and many became restless. Another complication arose. The West wished to know more of its irrigation possibilities, and energy and money were diverted to irrigation surveys. This function culminated in 1890, when Congress cut off the irrigation work for a time. Mining and economic work began to push to the fore again, until August, 1892, when the appropriation for geology was cut down by legislative action from $115,000 to $50,000; for chemistry, from $17,000 to $5,000; for scientific salaries, from $67,700 to $29,900; for engraving geologic maps, from $60,000 to $10,000; for illustration of reports, from $16,000 to $5,000, and for paleontology, from $40,000 to $10,000. Topography nearly escaped, the change being from $250,000 to $240,000. Readjustments were made from year to year, and some of the amounts have been restored, so that at the present time the general work of the Survey is progressing in a satisfactory manner, with the exception of mining geology.

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[1] An admirable review of the mining work of the United States Geological Survey under its first Director is contained in Trans. Am. Inst. Min. Eng., Vol. X, p. 412.

It is well understood that good topographic maps must precede areal geology, and that the latter must be worked out and platted before deductions of permanent value can be made in relation to the extent or permanency of a mining region or district. With this in view, the present policy of the Geological Survey in relation to mining will be best shown by a brief résumé of the work under way during the last field season, a more extended account of which will be found on later pages.

TOPOGRAPHIC SURVEYS.

All the topographic work has an economic value, but not always to mining industries. Yet much of it is important to mining, especially in the States where the mineral product is large.

The area covered by topographic surveys during 1899 is as follows:

Area covered by topographic surveys in 1899.

Division.	Scale, 1 mile to inch.	Scale, 2 miles to inch.	Scale, special	Total.
	Square miles.	*Square miles.*	*Square miles.*	*Square miles.*
Atlantic Division	6,591	3,345	....	9,936
Central Division	3,648	7,125	32	10,805
Rocky Mountain Division	90	7,784	55	7,929
Pacific Division	388	6,782	24	7,194
Total	10,717	25,036	111	35,864

As in previous years, there was a certain amount of resurveying, for the purpose of adjusting to the requirements of present standards of precision certain maps which had been made under less exacting conditions. The area this covered was 6,364 square miles.

The present condition of the topographic surveys is shown in the table on page 116. A history of these surveys is given in Part I of the Twentieth Annual Report, pages 90-102.

GEOLOGIC SURVEYS.

In New York and Vermont the detailed study recently made of the great roofing-slate belt was supplemented in 1899 by the survey of adjoining areas into which the slate-bearing series extends. The work on the iron-bearing formations of the Adirondack Mountains, New York, was continued, and in Maryland cooperation with the State survey resulted in the survey of the marl-bearing series. The mapping of the coal fields of West Virginia was advanced by 1,000 square miles of area, and in Illinois the survey of the Danville quadrangle was completed. In the glaciated regions of Wisconsin, Illinois, Indiana, Michigan, and Ohio investigations were continued in the glacial gravels and clays, which have great economic importance to the people of the areas where they occur.

The Survey has recently published an extended monograph on the Crystal Falls iron-bearing district of Michigan. Last season the Lake Vermilion district was under survey, and this work, with the topographic surveys in the Mesabi region, was well advanced. The mapping of the coal fields of Indian Territory in the vicinity of McAlester and thence southward was pushed forward.

In the Rocky Mountain region the survey of the gold-bearing rocks in the San Juan Mountains of southwestern Colorado was pursued during the entire season, the topographic maps being prepared on the scale of 1 mile to the inch.

The detailed economic survey of the Deadwood district in the Black Hills was practically completed, the areal geology having been mapped during the last two years. In Montana work was continued in the Elkhorn district, and a careful resurvey was made of the mines in the Butte district, for the revision of the geologic map of Butte and vicinity. The exploration of the almost unknown area of central Idaho was continued during the field season, and valuable data were secured for future detailed work. An extended reconnaissance was also made through the Basin Ranges of Utah and Nevada with a view to future work. In the Silver Peak gold district of Nevada the areal geology was completed.

For several years studies have been made of the physical conditions of gold deposition in California, especially with reference to the Mother Lode. It is anticipated that this work will be brought to a close during the season of 1900, and that a monograph will be published on the subject. The areal geology of the Gold Belt has all been mapped, and much of it published. Investigations were also made in California with relation to the deposits of oil and asphalt. In Oregon a reconnaissance was carried through the Klamath Mountains with the view of determining their mineral resources and the desirability of making detailed maps. Some work was carried on in Washington two years ago, and the present season the areal geology of the Mount Stuart quadrangle and of a considerable portion of the Snoqualmie quadrangle to the west was completed.

In Alaska a reconnaissance was made of the Upper Koyukuk region, also of the area about the headwaters of the Tanana, and, late in the season, of the Cape Nome district.

In addition to the above-mentioned special investigations, visits were made by geologists to many areas in various sections of the country, with a view to the prosecution of work in the future. The work of the Division of Mineral Resources was pushed forward energetically under a substantial increase of its appropriation. The field examination of the distribution, extent, and value of special minerals was enlarged by taking up asphalt deposits, while the problems of phosphates, fuller's earth, etc., received additional attention.

PROGRESS MAP, 1879-1900.

In accordance with custom, there is presented herewith (Pl. I) a progress map showing the condition of the work of the Topographic Branch of the Survey. The accompanying map, Pl. III, however, presents for the first time the combined results of both topographic and geologic surveys. It shows separately the topographic surveys on the scales of 1, 2, and 4 miles to the inch, and the areas of geologic reconnaissance and detailed geologic surveys.

The following summary, broadly arranged under special minerals, gives a general view of the geologic work represented geographically on the progress map:

Schedule of Topographic and Geologic Surveys, 1879-1900, with Partial Reference to Related Publications.

(To accompany the progress map, Pl. III.)

GENERAL SURVEYS.

Topographic surveys, scales 1, 2, and 4 miles to the inch.

Geologic reconnaissances.

Detailed geologic surveys, including investigations of mineral and artesian water resources in general, published or in preparation for publication as folios of the Geologic Atlas, as articles in the annual reports, or as monographs, bulletins, or water-supply papers. (Geologic folios published, 60; initiated and in various stages of preparation, 57.)

SURVEYS OF MINERAL DISTRICTS.

METALLIFEROUS DEPOSITS.

GOLD, SILVER, AND ASSOCIATED METALS.

Appalachian	Southern gold field—Becker, Keith, Hayes—Sixteenth Annual Report and geologic folios in preparation.
South Dakota	Black Hills—Emmons, Jagger—Twenty-first Annual Report and geologic folio in preparation.
Colorado	Leadville — Emmons — Monograph XII and Second Annual Report.
Colorado	Tenmile district—Emmons—Special Geologic Folio No. 48.
Colorado	Aspen—Emmons, Spurr—Monograph XXXI.
Colorado	Anthracite and Crested Butte quadrangles—Emmons, Cross, Eldridge—Geologic Folio No. 9.
Colorado	Rosita Hills and Silver Cliff—Cross, Emmons—Seventeenth Annual Report.
Colorado	Cripple Creek—Cross—Sixteenth Annual Report and Geologic Folio No. 7.
Colorado	Telluride, La Plata, Rico, and Silverton quadrangles—Cross, Purington—Eighteenth Annual Report; Twenty-first Annual Report; Geologic Folio No. 57, and others in preparation.
Utah	Mercur district—Emmons, Spurr—Sixteenth Annual Report.
Utah	Tintic—Emmons, Tower, Smith—Nineteenth Annual Report, Geologic Folio No. 63.
Wyoming	Absaroka—Hague—Geologic Folio No. 52.

Montana	Fort Belknap Indian Reservation and Bearpaw Mountains—Weed—American Journal of Science, 1896; Journal of Geology, 1896; Engineering and Mining Journal, 1896.
Montana	Judith Mountains—Weed—Eighteenth Annual Report.
Montana	Boulder quadrangle—Weed—Geologic folio in preparation.
Montana	Elkhorn mining region—Weed—Twenty-first Annual Report.
Montana	Butte — Emmons, Weed — Special Geologic Folio No. 38.
Montana	Neihart, Barker, and Yogo districts—Weed—Twentieth Annual Report.
Montana	Castle Mountain district—Weed—Bulletin No. 139.
Montana	Little Belt Mountains and Fort Benton quadrangles—Weed—Geologic folios Nos. 55 and 56.
Idaho	Idaho Basin and Boise Ridge—Lindgren—Eighteenth Annual Report.
Idaho	Elk City, Buffalo Hump, Pierce City, and Cœur d'Alene—Lindgren—Report in preparation.
Idaho	Silver City, De Lamar, Wood River, Florence, Warren, and Seven Devils—Lindgren—Twentieth Annual Report.
Washington	Mount Stuart quadrangle—Smith—Geologic folio in preparation.
Oregon	Coast gravels—Diller—Fourteenth Annual Report.
Oregon	Northwest Oregon—Diller—Seventeenth Annual Report.
Oregon	Bohemia and Blue River mining regions—Diller—Twentieth Annual Report.
Nevada	Eureka district—Hague, Curtis—Monographs VII and XX, and Third and Fourth annual reports.
Nevada	Comstock lode and Washoe district—Becker—Monograph III and Second Annual Report.
Nevada	Silver Peak quadrangle—Turner—Geologic folio in preparation.
California	Gold Belt—Lindgren, Turner, Diller, Ransome—Geologic folios Nos. 3, 5, 11, 15, 18, 29, 37, 39, 41, 43, 51, and others in preparation; Eighth, Fourteenth, and Seventeenth annual reports.
California	Calico district—Lindgren—Transactions of American Institute of Mining Engineers, vol. 15.
Alaska	Southern gold fields—Becker—Eighteenth Annual Report.
Alaska	Yukon and other gold fields—Spurr, Eldridge, Schrader, Brooks, Mendenhall — Special Alaska reports, 1898 and 1899; Eighteenth, Twentieth, and Twenty-first annual reports.

IRON ORE.

Appalachian	Clinton ores—Hayes, Keith, Darton—Geologic folios Nos. 2, 4, 6, 8, 12, 14, 19, 20, 21, 26, 28, 32, 33, and 35.
Appalachian	Southern limonites—Hayes—Science, 1897.
North Carolina	Magnetites—Keith—Report and geologic folio in preparation.
New York	Adirondack magnetites—Kemp—Nineteenth and Twentieth annual reports, geologic folio in preparation, and Transactions of American Institute of Mining Engineers, vol. 27.
Michigan	Lake Superior iron districts—Irving, Van Hise, Bayley, Clements, Smyth—Tenth, Fifteenth, and Nineteenth annual reports; Monographs XIX, XXVIII, and XXXVI; and Special Geologic Folio No. 62.
Minnesota	Vermilion and Mesabi iron districts—Van Hise—Reports in preparation.
Montana	Little Belt Mountains—Weed—Twentieth Annual Report and Geologic Folio No. 56.

QUICKSILVER.

Texas	Terlingo district—Hill—Report in preparation.
California and Nevada	Coast Ranges of California and Steamboat Springs, Nevada—Becker—Monograph XIII and Eighth Annual Report.

ZINC AND LEAD.

New Jersey	Franklin Furnace zinc deposits—Wolff—Geologic folio in preparation.
Missouri	Mississippi Valley zinc and lead deposits—Jenney—Transactions of American Institute of Mining Engineers, vol. 22.

COPPER.

Wisconsin	Lake Superior copper belt—Irving, reconnnaissance and compilation—Monograph V and Third Annual Report.
Montana	Butte district—Emmons, Weed—Special Geologic Folio No. 38.
Tennessee	Ducktown district—Hayes, Keith—Geologic folios in preparation.
North Carolina and Virginia	Virgilina, Gold Hill, and Linden copper districts—Weed—Report in preparation.

NONMETALLIFEROUS DEPOSITS.

COAL, OIL, AND GAS.

Appalachian	Bituminous field—Campbell, Keith, Hayes, Willis, Darton, Taff, Weeks—Fourteenth and Seventeenth annual reports; Bulletin No. 111; Geologic folios Nos. 6, 8, 12, 19, 21, 22, 26, 28, 33, 34, 35, 40, 44, 46, 47, and 53, and others in preparation.

Pennsylvania	Anthracite field — David White — Twentieth Annual Report.
Massachusetts	Narragansett coal field—Shaler, Woodworth, Foerste—Monograph XXXIII.
Virginia	Richmond Basin—Shaler, Woodworth—Nineteenth Annual Report.
Illinois	Danville quadrangle—Campbell—Geologic folio in preparation.
Ohio and Indiana	Gas and oil field—Orton—Eighth Annual Report.
Indiana	Gas region—Phinney—Eleventh Annual Report.
Indian Territory	Coal field—Taff—Nineteenth and Twenty-first annual reports and five geologic folios in preparation.
Texas	Rio Grande coal fields—Vaughan—Bulletin No. 164.
Texas	Corsicana oil field—Hill—Report in preparation.
Colorado	Denver Basin—Emmons, Cross, Eldridge—Monograph XXVII.
Colorado	Anthracite and Crested Butte quadrangles—Emmons, Cross, Eldridge—Geologic Folio No. 9.
Colorado	Durango and La Plata quadrangles—Cross—Geologic folios in preparation.
Colorado	Elmoro, Spanish Peaks, and Walsenburg quadrangles—Hills—Geologic Folio No. 58, and two in preparation.
Colorado	Florence oil and gas field—Eldridge—Engineering and Mining Journal, vol. 52.
Wyoming	Coal and oil fields—Eldridge, reconnaissance—Bulletin No. 119.
Montana	Livingston and Fort Benton quadrangles—Weed—Geologic folios Nos. 1 and 55.
Montana	Great Falls and Red Lodge areas—Weed—Bulletin of Geological Society of America, vol. 3.
Montana	Judith Mountains—Weed—Eighteenth Annual Report.
Montana	Cinnabar and Bozeman field—Weed—Bulletin of Geological Society of America, vol. 2.
Washington	Tacoma coal field—Willis, Smith—Eighteenth Annual Report and Geologic Folio No. 54.
Washington	Mount Stuart quadrangle—Smith—Geologic folio in preparation.
Oregon	Coos Bay Basin—Diller—Nineteenth Annual Report.
California	Mount Diablo—Turner—Bulletin of Geological Society of America, vol. 2.
California	Jackson quadrangle—Turner—Geologic Folio No. 11.
Alaska	General report — Dall — Seventeenth Annual Report.

MARBLE.

Tennessee	"Tennessee" marble—Keith, Hayes, Campbell—Geologic folios Nos. 4, 10, 12, 16, 25, and 27.
Georgia	"Georgia" marble—Hayes, Keith—Geologic folios in preparation.
Massachusetts	Stockbridge marble—Dale, Hobbs, Emerson—Geologic folios in preparation.

SLATE.

Tennessee	Ocoee slates—Keith, Hayes—Geologic folios Nos. 16, 25, and others in preparation.
New York and Vermont	Slate belt—Dale—Nineteenth Annual Report and geologic folios in preparation.

PHOSPHATES.

Tennessee	Phosphate districts—Hayes—Seventeenth Annual Report.
Florida	Phosphate district—Eldridge—Transactions of American Institute of Mining Engineers, vol. 21, and detailed report in preparation.

ASPHALTS.

Utah	Uinta Basin—Eldridge—Seventeenth Annual Report.
Indian Territory	McAlester, Antlers, and Winding Stair quadrangles—Taff—American Journal of Science, 1899, and geologic folios in preparation.
Texas	Uvalde quadrangle—Vaughan—Eighteenth Annual Report.
Texas	Burnet deposit—Hill—Report in preparation.
California	San Luis Obispo district—Fairbanks—Geologic folio in preparation.
United States	General investigation of the deposits in West Virginia, Kentucky, Missouri, Colorado, Indian Territory, Texas, and California—Eldridge—Twenty-first Annual Report.

BAUXITE.

Alabama	Appalachian province—Hayes—Mineral Resources of the United States for 1893 and Sixteenth Annual Report.

ARTESIAN WATER AND RESERVOIR SITES.

Atlantic Coastal Plain	Darton—Bulletin No. 138.
Illinois	Water resources—Leverett—Seventeenth Annual Report.
Indiana and Ohio	Well waters—Leverett—Eighteenth Annual Report, and Water-Supply Papers Nos. 21 and 26.
Kansas	Underground waters, southwest Kansas—Haworth—Water-Supply Paper No. 6.

Kansas, Colorado, and Nebraska	Water resources, Great Plains—Hay—Sixteenth Annual Report.
Dakotas	Artesian waters, eastern Dakota—Darton, Todd—Seventeenth and Eighteenth annual reports, and Water-Supply Paper No. 33.
Dakota and Wyoming	Black Hills—Darton—Twenty-first Annual Report.
Nebraska	Water resources, western Nebraska—Darton—Nineteenth Annual Report.
Nebraska	Water resources, southeast Nebraska—Darton—Water-Supply Paper No. 12.
Colorado	Pueblo, Apishapa, and Nepesta quadrangles—Gilbert—Geologic Folio No. 36, and two in preparation.
Colorado	Arkansas Valley—Gilbert—Seventeenth Annual Report.
Colorado	Spanish Peaks, Walsenburg, Elmoro, and Huerfano Park quadrangles—Hills—Geologic folios in preparation.
Utah	Salt Lake City—Newell—Twelfth Annual Report.
Texas	Artesian waters—Hill, Vaughan—Eighteenth and Twenty-first(?) annual reports.
Arizona	Gila River storage water—Lippincott—Water-Supply Paper No. 33.
California	Southern California—Lippincott—Water-supply papers in preparation.
Washington	Artesian basins, southeast Washington—Russell—Water-Supply Paper No. 4.

MARL.

Maryland and Virginia	Marls—Darton—Geologic Folio No. 23, and others in preparation.

ECONOMIC WORK AND THE MINING INDUSTRY.

In Government organizations depending upon the will of so complex a body as Congress it is often difficult to carry out a policy outlined in advance. Usually the policy is modified by considerations not of what it is abstractly best to do, but of what it is possible or practicable to do. This compels the administrative officer to aim at the nearest attainable approximation to the desired object.

It has been well said that there are three standpoints from which the relations of the Geological Survey to the mining industry in general may be viewed: First, the more purely scientific or geologic side; second, the technical side; third, the commercial side.

The general principle upon which the Survey has been doing its economic mining work is that it should endeavor to accomplish for the mining industry as a whole what the individual mining engineer or mine owner can not succeed by his unaided exertions in doing; that it should not undertake to do what could be done as well, if not better, by individual exertion; that it should not interfere, either favorably or unfavorably, with the private business of individuals or corporations, or enter into competition in their legitimate occupations with professional men, such as mining engineers, etc. This is implied in the clause of the organic law of the Survey which provides that "The Director and members of the Geological Survey . . . shall execute no surveys or examinations for private parties or corporations."

If it were more generally understood that such is a proper limitation of the work of the members of the Survey, they would not be asked, as they frequently are, to tell some individual or corporation whether his or its land contains valuable mineral deposits, since all the information they are at liberty to impart with regard to that land is contained in the published maps and reports, which may be obtained by all. If the individual or corporation is unable to deduce from these publications all the commercial data that may be desired, a mining engineer should be employed. An attempt by the Survey to acquire and communicate such information respecting any special parcel of land would be in the nature of a report for private parties, which would be an interference with the business of the mining engineer and a violation of law. Neither should the Survey be called upon to assay or analyze ores for private parties, for that is manifestly interference with the business of the assayer; nor should it be called upon, as it sometimes is, to tell a man what process, or which of two or more processes, is best adapted for the treatment of his ores. Even if the members of the Survey were fitted to pass judgment upon the relative value of technical processes or machines, and should pronounce such judgments, they would naturally be regarded as interfering unwarrantably with the business of the person or corporation owning a process or machine which was not favorably considered in the report. If it were proper for the Survey to do work of this nature it would be impossible to acquire the knowledge necessary to meet such demands with the amount of money at present available, or even with ten times that amount.

The means for economic work being limited, only a small proportion of the broad field opened for investigation can be occupied at any one time. On this account, the energies of the Survey have been devoted to those branches of investigation which were of immediate use to the greatest number; and these have been, in the main, investigations leading to broad general deductions.

GEOLOGIC INVESTIGATION.

In the field of more purely geologic investigation the general object has been the determination of the laws which govern the formation of deposits of the useful minerals, and of the rock formations in which they are most likely to be found. This object can be attained only by long and careful study of many and varied deposits—as far as possible in the condition in which they were originally formed. Ore deposits are, as a rule, the result not of a single process, but of many successive concentrations of minerals; and in those deposits which are found near the present surface the effects of the latest of these processes—weathering, or the action of surface waters—are likely to have obscured all others. In order best to accomplish the object sought, the first studies were made of mining districts in which mining developments have been most extensive, the mines are deepest, and the most varied forms of ore deposits have been disclosed.

In the prosecution of these studies the geologists often obtain results of immediate value to the miners and mine owners of the particular district under investigation, such as the determination of the probable direction which the ore bodies will take in unexplored ground, the faults which are likely to cut them off, and other obvious limitations which geologic conditions may suggest. These results are often of secondary importance as compared with the more general deductions, being useful to only a few persons interested in a limited district, while the general deductions, if correct, are of benefit to the whole mining community.

A brief statement of the underlying principles which govern the choice of fields of work is here made, because that work has been frequently criticised, the criticism made by miners being that the Survey chooses developed districts, where the general facts with regard to ore deposits are already known, rather than undeveloped districts, where the predictions might be of more use to those who own mines, and might actually help in their development. From a partially developed district we can usually learn only superficial facts, which are not likely to yield any contribution to general laws. Whatever may be said of the probable value of such a district belongs to the province of the mining engineer rather than to that of the Government geologist, since it involves such preliminary work as sampling of ores, prospecting, development, etc., which the geologist can not do.

Another criticism has been that more work is done in one State than in another. But if it be admitted that the principles mentioned should govern the work, it is evident that the Survey can not be guided by geographic or political considerations, but must study ore deposits where they can be studied to the best advantage. In the topographic work a more or less general geographic distribution has been possible, and it is also desirable, but in geology the Survey must continue to be the judge of the importance and interdependence of the problems to be solved and of the best method of solving them.

In the original plan of Survey publication the monographs were designed to set forth each the results of a complete and, so far as possible, exhaustive treatment of a given subject or group of geologic phenomena; the bulletins were meant to be reports of special studies, not necessarily exhaustive, but, for one reason or another, deserving of immediate publication; while papers in the annual report were intended to be less technical in character, of general rather than special interest, and to include abstracts, in somewhat popular form, of monographic studies. It was found desirable, as time went on, to modify this plan, as it has been found wise to adhere not too strictly to that laid down for the conduct of the work itself. Thus, for a time the outside demands for economic surveys, solely on the secondary ground of their usefulness to those interested in mining in the special districts examined, increased very rapidly, while the force and funds available for economic work were actually decreasing, so that the monographic treatment became unadvisable as a matter of policy, and the work was spread over a greater number of regions by devoting less time and labor to each.

In the latter part of the first decade and the first part of the second decade of the Survey's history a very large proportion of the appropriation was devoted to the preparation of topographic maps, which serve as a basis for the work for which all geologic surveys are primarily organized The making of a geologic map of so large an area as is included within the boundaries of our country is a far greater task than has been given to any previous Geological Survey. It is continental in its nature, and long deliberation and careful planning were required before publication could be entered upon, for the first essential is uniformity in all the parts, and therefore a plan once adopted should be carried out logically to its completion.

It was not until 1894 that the publication of the sheets of the Geologic Atlas of the United States in their final folio form was commenced. About sixty of these folios have now been published—that is, at the present rate, about ten per annum. Owing to the great degree of accuracy required in the color printing of these maps, their extreme complication, and the consequent necessity of personal supervision by the authors during the various processes involved, every part of this work, from the original drawing to the final printing and binding, is done in the Survey buildings. It was originally supposed that, with the present facilities for engraving and printing, the output would be twice as great as it is at present; but the advance in accuracy of geologic field work, and the consequent increase in elaborateness of representation, have proceeded at a more rapid pace than has the growth of the means of publication.

Areal geologic mapping, as the work represented on folio sheets is designated, is always of economic importance, and probably over 90 per cent of the areas for folios were chosen largely because of the value they would possess in the development of mineral resources.

A correct geologic map is the first and most essential basis for the study of a mining district; and where the deposits are beds in sedimentary strata, as is the case with coal, and sometimes with iron ore and other substances, it furnishes practically all that the mining engineer needs for opening and exploiting the mines. By the folio publication, however, a new avenue is opened for disseminating geologic information promptly and without waiting for a final and exhaustive report. Where important groups of mines are concentrated within small areas, special maps of size to fit the folio are made of those areas, on the largest practicable scale, accompanied by sections and explanatory texts setting forth in concise terms the main facts of importance to the miner, and these are published as special folios—that is, folios that do not form an integral part of the Geologic Atlas of the United States. In this form there have already been published folios covering the Cripple Creek and Tenmile districts in Colorado, the Nevada City in California, the Butte in Montana, and the Menominee in Michigan. A folio of this form often supplements a monographic report, as it meets the demand of the mine owner for more prompt issue and may be produced at smaller cost than a monograph. On the other hand, it is less likely to result in scientific deductions of general applicability, unless it is followed by a monographic report.

During the second decade of the Survey's existence there has been a decided increase in economic work. One or more parts of the Annual Report are now devoted to papers of an economic nature, by which means more prompt publication and wider distribution are secured for papers of this character. In this period five monographs and as many bulletins devoted to special mineral deposits have been issued, to say nothing of those indirectly bearing upon economic interests. Three of the five monographs treat of the iron-ore deposits of the Northwest, a preponderance explained by the fact that mine owners in that region have themselves contributed many thousand dollars for the preparation of a topographic base for the work.

Another form of economic study, which may be called the incidental economic survey, and which has a very wide field in the future, is connected more directly with the folio publication. When a quadrangle that is being geologically mapped contains mines that are especially important, but not so near one another that they can be included in a special map, a trained economic geologist is detailed to make a study of these mines, and a concise summary of the results is added to the explanatory text. If these results are of sufficient importance, a more complete report is printed in the Annual Report, or as a bulletin. Such a study has already been made of the Telluride quadrangle, and similar studies of the Silverton quadrangle in Colorado and of the Sturgis and Spearfish quadrangles in the northern Black Hills are in progress.

It may be anticipated that in the course of time the incidental areal surveys and studies of special minerals will gradually supersede those of the small groups of important mines, but at present plans are made for surveys of a dozen or more mining districts in the western part of the United States, and of several in the central and eastern parts, which, under the present appropriations, can be taken up only one at a time and at considerable intervals.

TECHNICAL INVESTIGATION.

In the line of what may be considered technical studies, the duties of the Survey toward mining industry are less easy to define; for here there is more danger of encroaching upon the legitimate field of the mining engineer or metallurgist. Yet the same general principle is applicable, namely, that the Survey should confine itself to those investigations which it is better fitted to make than is the individual. Thus, in the early work on Leadville, where lead smelting had reached a stage of development before unknown in this country, it was thought that a scientific discussion of the processes involved, in the light of the improvements made in practical methods, would be of advantage to the smelting community throughout the country. But it was found that, so great was the commercial importance of the industry, and so rapid the advancement in metallurgic science, the delays inherent in a Government publication greatly impaired, if they did not altogether nullify, its value. Except in a few special cases, it has not, therefore, been thought advisable to follow out this line of work. Incidentally, as many are aware, the investigations of Dr. Barus in the physical laboratory of the Survey on the iron carburets, although undertaken for purely scientific ends, have been of far-reaching practical importance to the iron industry of the country. This serves to illustrate the truth that, however remote from any apparent practical purpose a theoretic study may be, it is likely at any time to prove of practical scientific importance, and its application is broader, as a rule, than that of investigations which have only immediate practical ends in view.

It is evident that the investigation of technical processes in their commercial application is not a legitimate function of the Survey. Its employees are expressly debarred from a commercial use of their knowledge, and are chosen for their proficiency in geology rather than in technology. There may arise cases, however, in which it will appear possible for them to determine the underlying principles or laws that should govern some widely applied technical process, and in which it will seem advisable and proper for them to undertake such investigations.

COMMERCIAL OR STATISTICAL INVESTIGATIONS.

There remain to be considered the relations of the Survey to the purely commercial side of the mining industry; and here the principle of doing what it is inherently better fitted to do than is the individual is more easy of application. It seems evident that the collecting of accurate statistics of the mineral productions of the country, which form the most important basis of all mining business, is a prime duty of the Survey. No branch of statistical science is in greater need of technical knowledge and thorough system than that which deals with mineral production, and none is more liable to be led into error if the collector's opinions are in any way biased by his interest. There is no body of men more absolutely disinterested than the employees of the Survey, since, under the law, they can have no commercial interest in the subjects which they treat. Their field of work is so wide that, by one or another, a certain personal familiarity with all the sources of supply of the various mineral products of the country is acquired, which is available for the guidance of the statistical division.

At the last session of the Fifty-fifth Congress an amendment was introduced establishing a Division of Mines and Mining in the Survey. This extended its sphere of statistical work to gold and silver, and made a special appropriation for the division. It also provided means for the more prompt publication of its reports. Had this amendment passed, it is believed that the usefulness of the work of the Survey would have been very materially increased. All of its various economic branches would then have been conducted under the supervision of a single chief, by which means a more uniform and comprehensive system, both of field work and of publication, might have been inaugurated.

STATISTICS OF MINERAL RESOURCES.

The statistical work of the Tenth Census brought together such men as Emmons, Becker, Pumpelly, Peckham, Willis, Eldridge, and others who contributed to the volume on mining. Later Mr. Albert Williams, jr., was placed at the head of a division of the Survey created for the purpose of carrying on this work, and known as the Division of Mining Statistics and Technology.

Mr. Williams's plans were so well made that the results were excellent, and they admitted of simple expansion as the needs and facilities of the Survey made such expansion necessary and practicable. Mr. Williams's aim was to use the small means at his disposal to secure the cooperation of every individual and institution for that particular contribution upon which he or it was the best authority. Primary attention was paid to locating and describing the known mineral localities, even down to those of rare elements. The work was arranged wisely, according to mineral substances rather than geographic regions, since each mineral industry was the interest intended to be served. This resulted in the series of publications called the Mineral Resources of the United States. The first volume, published in 1883, contained, in addition to a statement of the distribution of our useful minerals, the best estimates obtainable of the total amount of each mineral produced in the year 1882, and comparative statements of the growth of each industry since the census year—in so far as it could be predicted what the results of the census would be when they should finally be published. The geographic distribution was not neglected, however, but was concisely set forth in a tabular statement showing the minerals which might prove useful in each district; and the volume contained also separate contributions on special themes of mining technology.

On this foundation a volume has been published each year since 1883. The second volume gave greater attention to the secondary feature of production and of our relations as mineral producers to the rest of the world, as shown by our import and export trade. The third volume was more limited in scope, being published in a transition period, when Mr. Williams left the direction of the work to become director of the Michigan Mining School, and was succeeded by Dr. David T. Day.

These three volumes have certain characteristics which are not only interesting, but deserving of attention, now that they can be looked at from a historical point of view. While the later volumes are probably better known, the three pioneer volumes were of unusual importance at the time they were published, when facilities were meager and guiding precedents few. They show the work of one whose careful judgment harmonized, when necessary, the diverse contributions of many coworkers. Each chapter was prepared by an expert. Each was a strong, terse expression of the conditions of the industry discussed. The chapters were as different in scope and in method of treatment as the materials themselves. Uniformity was neither possible nor desirable; but all were characterized by fair statements of the measure of reliability to which the statistics were entitled.

Dr. Day, who has had charge of the succeeding volumes, came to the work with the prejudices of a technologist, but he left to the technologic press the subject of mining technology, except where some process had effected a significant development in mining. It seemed essential that the Survey should become a source of independent scientific statistics of the amount of each mineral produced, since no other agency than the Government can become the impartial and permanent source of reliable statistics, any more than we could expect coins to prove acceptable from any other source than the Mint. By the advice of such census experts as Gannett, Weeks, and Swank, and with the cooperation of such statisticians as Kirchhoff, Birkinbine, and Yale, every effort was made to secure a list of the mineral producers of the United States, and to obtain from each one of them, by correspondence and such visits as could be made, a statement of his product each year.

The means at command were inadequate to a complete result; but each year has seen the lists grow more nearly complete, and has shown less necessity for adding to returns by information from outside sources. The statistics of mining for the Eleventh Census were collected by the Survey. This experience added greatly to subsequent efficiency. At the present time the work is practically an annual census of the product of all mines, except those of precious metals. The statistics of gold and silver were excepted in the original plan, in 1882, out of courtesy to the Director of the Mint, who desired to retain this portion of the work.

When the division abandoned the subject of mining technology, its designation was changed to the Division of Mineral Resources. In accordance with the duties implied by this title, more and more attention has been paid to statements of the geologic and geographic distribution of our mineral wealth, whether developed or not; and the immediate future will see this important work of the Survey expanded. Special subjects, studies of which are now more or less advanced toward completion, are the phosphate deposits of Florida, the clays of the Eastern States, bauxite in Arkansas, fuller's earth in South Dakota, and the asphalts and bitumens of the whole United States.

HYDROGRAPHIC INVESTIGATIONS.

For more than ten years the Division of Hydrography of the Survey has been making measurements of the streams and computations of their daily discharge at various points. At the same time it has been investigating the movements of underground waters and the causes which give rise to them. The results have economic importance to the miner in his underground operations, as he must often contend with water, and his ability to dispose of it successfully may govern the question of profits. He often seeks in flowing water the power for operating, directly or indirectly, mines, mills, etc. In many sections the location of reduction works is governed largely by the question of water supply and its permanence through seasons and years. The results of the investigations of the hydrographers are sought in considering the erection of plants of this character.

There is also an indirect way in which the question of water supply affects the feasibility or profits of mining. Throughout the western third of the United States, from the Rocky Mountain region westward, there are great deposits of ore, the value of which per ton is so small that they can not be profitably worked unless many conditions are favorable, such as cheap food stuffs and ready transportation, by which the cost of living and of labor may be reduced. The region as a whole is arid, and farm and other products, brought from the humid regions, are expensive. By the development of agriculture through irrigation, and the building up of small producing communities throughout the semiarid and arid West, the cost of living is greatly reduced, and it becomes practicable to work to advantage mineral deposits otherwise unprofitable. This dotting of the country with farms and villages is possible through a careful conservation of the available waters, such as can result only from a thorough knowledge of the natural conditions. This knowledge is being obtained, through the Division of Hydrography, as rapidly as the means available will permit.

Future of the Survey in Relation to the Mining Industry.

In considering the operations of the Survey, past, present, and future, it must be borne in mind that all estimates for appropriations are submitted to the Secretary of the Interior, who may reduce or change them as he thinks best, in view not only of the operations of the Survey, but of the needs of other bureaus of the Department and the sum total of the estimates. The estimates, and necessarily the plans, are again modified by Congress in making the appropriations. Special legislation is also occasionally needed in order to accomplish the best results in work already under way, or to enter some new field of investigation. Finally, after Congress has acted, all field and office plans of the Director, before being put into execution, are subject to the approval or disapproval of the Secretary of the Interior. To the practical miner and mining engineer all the red tape and delay seems only a useless hindrance to the development of the mining and other industries affected by the activities of the Survey. This is often the view of the men engaged in the work; but when a broad view of the entire field is taken, such delays and changes as may occur are of relatively small moment.

The work of surveying and preparing on a suitable scale the topographic and geologic maps of the 3,000,000 square miles of territory of the United States (exclusive of Alaska) is greater than any similar work heretofore undertaken by any nation. The study of the original sources of from $700,000,000 to $1,000,000,000 worth of mineral products each year, with the statistics pertaining thereto, is sufficient of itself to keep a bureau of the size of the Survey fully occupied. The investigation of water powers, of artesian, surface, and possible storage waters, and of domestic water supply, is an undertaking worthy of a strong, rapidly developing, and rich nation. The publication in practical and creditable form of the product of all of the activities of the Survey results in a contribution in original maps and text larger than that of any other scientific organization in existence.

With such conceptions of the scope of operations in mind, and with the results of a decade of work and progress in view, individual and local disappointments and forebodings disappear. The results already attained by this single bureau of the Government form a monument to the intelligent interest taken in its work by Congress and the hearty support given it by the several Secretaries of the Interior. The American people, as represented by Congress, desire to do what is right and just for governmental scientific organizations. Individual mistakes and narrowness of conception and action will occur at times, but as a whole the outlook is good, both for science and for the people of the nation. There is no doubt that the mining interests of the country are entitled to direct recognition by the Government, and it would seem that ere long such recognition will be given. Meanwhile the Geological Survey will aid as far as practicable in the development of the mineral resources and mining industries of the country. One of the latest bills relating to the mining industry has many commendable features. The function of the new department, as defined in the bill, is "to acquire, by examination, practical and scientific experiments, geological research, or otherwise, useful information on subjects connected with mining in the general and comprehensive sense of the word, and to diffuse the same among the people of the United States." It is further provided that the Geological Survey shall be the nucleus of the new department.

The establishment of a Division of Mines and Mining within the Survey would broaden the scope of its work and admit of a more direct application of the energies of the Survey to the mining industry. In a general way such a division should be charged with the promotion of the mining industry of the country as a whole, as far as it can be done by a Government organization, and in such way as not to interfere with the work of State organizations on the one hand or with the professional business of individuals on the other. It is difficult to specify the means and methods by which these ends could be best attained. Modifications would be required from time to time as experience dictated.

There should be published an annual report of the progress of the mining industry, which should show the most important advances made during the year and forecast the lines on which they would probably progress in the future.

From a commercial standpoint, an important subject which might properly be considered by a National mining bureau or by a Division of Mines and Mining in the Geological Survey is the promotion of our export trade. This should include the publication of maps, on as large a scale as practicable, showing the distribution of the economic minerals, reports on the methods and costs of transportation to the seaboard, the value of the product at points of production and at shipping ports, and other information of interest to buyers for foreign markets.

In regard to the question how a National Department of Mines and Mining could assist in the work which is local to the States, it may be said that, in addition to the benefit derived from the sources above enumerated, a bureau of mines might properly assist the local interests by correlating the work of the State geological surveys, so as to prevent duplication of work and secure uniformity of results. The collection of statistics might in some cases be carried on in cooperation with the State bureaus, and the saving thus effected be devoted to investigations of special interest to the cooperating States. A Department of Mines and Mining might also coordinate and harmonize State regulations of mining inspections, etc.

Much of the statistical work done by the Survey is duplicated by bureaus within the States. Few of the State bureaus, however, make complete canvasses of the mining industry. In the more important coal-producing States there are mining inspectors, a part of whose duty it is to collect the statistics of coal production, but in only one or two are the other mineral products considered. In a few States separate bureaus, the State geological survey and the mining inspectors, duplicate portions of the statistical work. It is unfortunate, but at the same time unavoidable, that another duplication is made in the work of the Geological Survey. Attempts have been made in some instances to cooperate with the State bureaus and avoid this duplication; and this is being done at present very satisfactorily in Iowa and Maryland. It would be well to extend this cooperation into all the States having such bureaus, the conflicting laws of the States and the frequent changes due to political revolutions being the principal obstacles to uniform and permanent plans.

Theoretically, the only investigations which can not be carried on by the State are those which necessarily carry the investigator beyond State boundaries; but conditions usually limit a State organization to investigations which have a direct and immediate practical application to the development of the mining industry, and such conditions and considerations preclude the State from taking up investigations looking to the establishment of fundamental principles whose application to the mining industry, while important, may be somewhat remote.

Foreign National Mining Bureaus.

In England and the continental countries of Europe the execution of the laws regulating mining operations comes under the jurisdiction of the national mining bureaus, and operators are required by law to report to these bureaus. Except in the Territories, a Federal mining bureau in the United States would have no such jurisdiction, and could act only in an advisory capacity within the States, depending, as the Division of Mineral Resources does at present, upon the willingness of producers to furnish information regarding their operations.

These foreign bureaus are occupied primarily with inspection of mines for the purpose of guarding the safety and health of operatives; and on the Continent, where the central government usually reserves to itself certain rights in regard to mining properties, they are intrusted with the enforcement and protection of these rights. Their duties are restrictive rather than promotive, and it does not seem that they offer much that is worthy of imitation by such an organization in the United States. Vastly more has already been done for the direct development of the mining industry in the United States by the Geological Survey in spite of the limited scope accorded to it under present laws. So true is this that foreign geologists and mining engineers are apt to hold up this work as a model that could well be imitated by their home organizations. A great advantage that an American organization generally has over a European is its freedom from too detailed and hence often restrictive regulation.

INSULAR SURVEYS.

At the first session of the Fifty-sixth Congress there was passed by the Senate (January 9, 1900) a resolution requiring a report on topographic and geologic insular surveys. The resolution was as follows:

Resolved, That the Secretary of the Interior be, and he is hereby, directed to submit to the Senate of the United States a report on—

First. The present condition and progress of the topographical and geological surveys, if any, which may have been inaugurated on the islands now under the jurisdiction of the United States.

Second. His recommendations as to further topographical and geological surveys on said islands.

The resolution was referred by the Secretary of the Interior to the Director of the Survey for a report thereon; and on January 19, 1900, the following letter and report (Senate Doc. No. 115) were transmitted to the Secretary of the Interior, and by him to the Senate:

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., January 19, 1900.

SIR: I have the honor to acknowledge the receipt, through reference by the Hon. Thomas Ryan, Acting Secretary, with instructions to consider and make early report, of a resolution of the Senate of the United States, dated January 9, 1900, requiring the Secretary of the Interior to submit to the Senate a report on—

> First. The present condition and progress of the topographical and geological surveys, if any, which may have been inaugurated on the islands now under the jurisdiction of the United States.
>
> Second. His recommendations as to further topographical and geological surveys on said islands.

The resolution has been carefully considered, and a report thereon is herewith submitted.

I am, with respect, your obedient servant,

CHAS. D. WALCOTT, *Director*.

The SECRETARY OF THE INTERIOR.

STATUS OF TOPOGRAPHIC AND GEOLOGIC INSULAR SURVEYS.

Availability of appropriations.—The United States Geological Survey has not been authorized to expend any part of its appropriation for surveys beyond the United States and Alaska. Accordingly, surveys of the islands now under protection of the United States have not been undertaken. In the present status expenses may now be incurred legally in surveys of Porto Rico and Hawaii, but the exhaustion of the appropriations by established work in the United States has made it inexpedient to divert any funds to those islands. Surveys of Cuba and the Philippines can not be begun without special authority.

Preparation for surveys.—Nevertheless, this Bureau has taken steps to secure information to direct plans for surveys when authorized. Mr. H. M. Wilson, geographer, in January, 1899, made a special trip to Porto Rico to ascertain the conditions affecting topographic surveying in the island. Mr. Robert T. Hill, geologist, has repeatedly visited Cuba, Porto Rico, and the West Indies in prosecuting geologic surveys. Although this scientific research outside the United States was carried on at private expense, the United States Survey holds such relations to it, through Mr. Hill, that the latest data are available. Hawaii presents well-known conditions for a general plan of survey. In the Philippines Mr. George F. Becker, geologist, has made such observations as were practicable under the circumstances existing since July, 1898. Members of the Philippine Commission have been consulted. In consideration of future insular surveys, there has been close cooperation with the Coast and Geodetic Survey.

CONDITIONS AND OBJECTS OF INSULAR SURVEYS.

Diversity of conditions.—The conditions demanding and affecting the prosecution of topographic and geologic surveys in Porto Rico, Hawaii, the Philippines, and Cuba are so diverse that each island must be separately considered.

PORTO RICO.

Occasion for topographic survey.—The area of Porto Rico, including the islands of Culebra and Vieques, is not positively known, but is approximately 3,800 square miles. The surface is so diversified by numerous hills and valleys and the population is so distributed through the island that a relatively large-scale topographic map is needed. The requirements are comparable with those of the Middle and New England States, where the Survey has adopted the scale of 1 mile to an inch, with contour interval of 20 feet. Drawn upon this scale, the atlas of Porto Rico may be published on twelve 15-minute atlas sheets of the standard size of the United States Survey atlas.

The few maps of Porto Rico at present extant are based on the work of the Spanish general staff and are inaccurate. As a result of the triangulation of the south coast, recently made by the United States Coast and Geodetic Survey, it was found that the old Spanish maps were 7 miles in error in 40 linear miles of coast line. The published maps indicate many roads and streams, but they show neither details nor the numerous trails, which are the highways of the country, with a degree of accuracy to permit of their being identified on the ground with the maps in hand. Although they are drawn on a large scale and seem to be accurate, these maps have no greater value than have the crudest of the county atlases of the United States. None of them show differences of elevation or surface relief.

Public works in the island of Porto Rico, the classification of valley and mountain lands, the very important problems of irrigation and water storage, and many other phases of economic development, require the preparation of an accurate topographic map.

Triangulation.—The primary triangulation upon which the topographic mapping must be based is being executed by the United States Coast and Geodetic Survey. During the past season that Bureau extended a sufficient amount of triangulation along the south coast to give initial control for the mapping of about three atlas sheets. This will have to be supplemented by secondary control, to be executed by this Bureau.

Spirit leveling.—The expense of spirit leveling for the control of topography will be a trifle greater than in the interior of the United States, owing to the ruggedness of the mountains, which cover the larger portion of the island, and the poor condition of the highways.

Cost of topographic survey.—An approximate estimate of the cost of making a satisfactory topographic map follows. The estimate is necessarily qualified, as so little is known from actual experience regarding the effects of the rainy season and climate upon field work. It is probable that surveys can be executed economically only during the winter months, from the middle of November until the middle of April, inclusive. During the remainder of the year the rainfall is exceedingly heavy and persistent and the temperature so high as to make outdoor work difficult for white men. The map should exhibit all the intricate details of relief and culture, including the great number of trails and dwelling places.

With these facts in view, it is estimated that the cost of mapping the island on the scale of 1 mile to an inch, with a contour interval of 20 feet, would average between $15 and $20 per square mile. This includes all cost of secondary triangulation, leveling, detailed topographic work, transportation, and office expenses. On this basis the total cost of the topographic survey of the island, with the adjoining smaller islands, will be between $50,000 and $75,000.

Geologic survey.—Geologic knowledge of Porto Rico is required to develop agriculture, irrigation, roads, and engineering works. These are urgent public needs. Occurrences of different soils are related to the distribution of the principal types of rocks—the limestones of the northern hills and coastal zone and the volcanic rocks of the interior. Advanced horticulture, reforestation, and agriculture in general demand soil classification and exploitation of mineral fertilizers. For the construction of roads, bridges, and buildings the available resources in road metal and building stones should be determined. Mineral deposits of more than local value are few, except those of iron, which promise important developments. The abundant water powers and water supply for irrigation should be measured. The geologic map should be the best possible on the scale of the topographic base—that is, as good as any now being made in the United States.

The cost of such a geologic survey is estimated at $5 per square mile, or approximately $20,000 for the entire island. The commencement of final work should be preceded by a geologic reconnaissance, to occupy the first season, at a cost of $3,000.

Recommendations for an appropriation of $16,000 for topographic and geologic surveys follow at the close of this report.

HAWAIIAN ISLANDS.

Physical conditions.—There are twelve islands in the Hawaiian group, approximating an area of somewhat over 6,000 square miles. Four of these, however, are barren and uninhabited rocks of inconsiderable size. The remaining eight islands, with their approximate areas, are as follows:

	Square miles
Hawaii	3,950
Maui	620
Oahu	530
Kauai	500
Molokai	300
Lanai	150
Niihau	100
Kahoolawe	50
Total	6,200

The islands are mountainous, and the measurement of relief should be a correspondingly important object of any adequate survey. Engineering problems affecting roads and irrigation are foremost in immediate development of the resources, and for their solution accurate delineation of grades and heights is of vital importance. The climate is favorable to field work.

Existing maps.—There existed for many years prior to annexation to the United States a Hawaiian government survey under the direction of Mr. W. D. Alexander, surveyor-general. Under this organization a system of triangulation has been extended over all the larger islands, which is considered amply sufficient for the requirements of the United States Geological Survey. The report of the surveyor-general for 1889 states:

> The survey of government lands and the settlement of boundaries have been the chief objects aimed at, rather than geodetic or topographical work.

The Alexander maps delineate only a skeleton of the relief by hachures, in a manner not adequate for engineering purposes, but probably so as to facilitate topographic surveys for accurate contours.

Geologic survey.—A geologic survey of the Hawaiian Islands is needed to promote the development of their resources and public works, to aid the territorial government in classifying lands, and to conduct researches into the remarkable past and existing volcanic phenomena. To organize and properly conduct such a survey will require the service of a man combining executive ability and special geologic attainment, to whom broad discretionary power may be given under general instructions from the Director of the United States Survey. The geologist in charge will need to direct the topographic survey; to conduct investigations into water power, water supply, and irrigation; to advise in regard to highway improvements and other public enterprises; to report upon mineral resources; to study the past and present distribution of lava flows, the volcanic processes, and the growth of the islands as volcanic structures, and to administer the authority and funds intrusted to him efficiently and satisfactorily. He will necessarily maintain an office in Honolulu and employ one or more geologic assistants, a clerk, and other aids from time to time.

Cost of topographic and geologic survey.—It is estimated that the topographic survey of the islands, covering 6,000 square miles, could be economically executed, on a scale of 2 miles to an inch, with contours 100 feet apart vertically, by one topographer and two assistant topographers, in three years, at an annual expense of $10,000 for salaries and field work.

For the geologic survey and administrative office the following estimate of annual expense accords with the best available data and experience:

For salaries (geologist in charge, $3,000; assistant geologist, $1,800; clerical assistance, $1,500)	$6,300
Field work, eight months at $300	2,400
Office rent and expenses, twelve months	800
Outfit, instruments, and experimental research	1,500
Special surveys and sundry expenses	1,000
Estimate for geologic survey and administration	12,000
Estimate for topographic survey	10,000
Estimate of total cost of surveys annually	22,000

The life of the topographic survey having been reckoned at three years, its cost would be $30,000. The geologic survey should continue at least five years, and its cost would be $60,000. Thus the total cost of the proposed survey would be $90,000. This does not include publication.

Recommendations follow at the close of this report.

PHILIPPINES.

Physical conditions.—Climate and wilderness combine to render surveys in the Philippines peculiarly difficult. The accessibility of separate islands and their individually moderate areas make surveys possible. The topography is mountainous. Five to seven thousand feet is the altitude of ranges in northern Luzon and in many of the larger islands. Several mountains rise to 8,000 feet, and one or two to 10,000 feet. Declivities are steep, but forested from sea to summits.

The attitude of the native peoples is not unfriendly over the greater part of the archipelago, and a well-conducted surveying party should have no difficulty, except where the Tagalos are numerous. Their presence in southwestern Luzon, Masbate, and Cebu would render necessary a military escort. Local banditti elsewhere are isolated. The distance of the archipelago from Washington will make it necessary that the survey shall be organized with headquarters at Manila, under a competent officer to whom much discretion may be given.

The variations of season and of healthfulness, the wide separation of islands, and the varied conditions require that the organization should be adaptable, active, and capable of independent action in all its parts.

Existing maps.—The coast charts are of two kinds, the old Spanish charts and the admiralty charts. The former are thought to be more correct, but none of the charts are reliable, even as to the position of the coast of the islands, which may be as much as 3 or 4 miles out of place. The maps of the interior are, in general, rude sketches, which are erroneous and misleading. Mindanao has been sketched by the Jesuits, probably with greater accuracy than any other island of the group. In the immediate vicinity of Manila careful surveys were executed by the Jesuits of the observatory, who prepared a good outline map extending as far as Caloocan.

Need of maps.—Administrative, military, and economic needs for maps are urgent. The most efficient available force should be sent to survey the islands, to accomplish the survey as soon as practicable. The plan of survey should be that which will give general but accurate information at an early date.

Surveys proposed.—It is assumed that the Coast and Geodetic Survey will accomplish the triangulation of the coast in advance of or in cooperation with the topographic parties of the Geological Survey. The triangulation may be extended inland by the latter where necessary, and they should conduct such surveys as will most satisfactorily result in a topographic map on the scale of 4 miles to an inch, with sketch contours at intervals of 200 feet. The primary object of the work should be to extend this reconnaissance over the archipelago.

A different problem in surveying is presented in the vicinity of Manila and the country tributary thereto. This is the most densely populated portion of the archipelago. It is also that in which military police operations will be most urgently required and should be rendered most efficient by adequate maps. This area should be surveyed on the scale of 2 miles to an inch, with 20 or 50 foot contour intervals, and the work of one party, under military escort, should be directed thereto. Three atlas sheets, of the standard United States Geological

Survey size, are apparently necessary to cover Manila Bay and the surrounding country. Additional sheets, extending to the Gulf of Lingayen, would no doubt be needed as rapidly as the survey could be pushed.

Cost of surveys.—For the organization of three topographic parties to conduct the above-described operations, the following is an approximate estimate of cost, in United States currency:

Salaries:		
Topographer in charge	$3,000	
2 topographers, heads of parties, at $2,400 each	4,800	
6 assistant topographers, at $2,000 each	12,000	
		$19,800
Field expenses, three parties eight months:		
6 American camp hands, $50 per month each	2,400	
18 native laborers, $5 per month each	720	
6 native boats, at $5 per month each	240	
Subsistence, 33 men, at $10 per month each	2,640	
Outfit and instruments, 3 parties, at $2,000 each	6,000	
Miscellaneous expenses, including rent, clerical assistance and drafting, medicines, repairs, transportation among the islands, and contingencies	5,400	
		17,400
Traveling expenses, 9 officers, Washington to Manila		1,800
Total, annually		39,000

The rate of progress of survey can not accurately be estimated, but comparing the Philippines with the most difficult forested region of the United States, it is probable that a party consisting of one topographer and two competent topographic assistants can survey 500 square miles per month on the scale of 4 miles to an inch. Assuming that health and other conditions permit eight months' field work in every twelve, as estimated, then two parties engaged in the general survey can accomplish 8,000 square miles per annum. The area of the islands being approximately 114,000 square miles, the survey would be completed in twelve or fifteen years. However probable it may be that the progress of the survey will be accelerated by enlarging the organization, that which has been proposed is believed to be adequate as an initial step.

Geologic reconnaissance.—The object of a geologic reconnaissance of the islands should be to ascertain those general facts of the geologic structure and of distribution of coal, copper, gold, and other mineral resources which must be known before capital can be intelligently directed to investment. Such a reconnaissance should be an exploration, proceeding more rapidly than the proposed topographic survey of the archipelago. The geologic party should therefore operate independently of the other parties. In the following statement the personnel is based upon the experience of the Geological Survey in this class of work. It affords a geologist and a topographer with a sufficient number of hands to render them independent each of the other in joint field operations.

Salaries:		
1 geologist, in charge of party	$2,400	
1 assistant topographer	2,000	
		$4,400
Field expenses, twelve months:		
2 American camp hands, $50 each per month	1,200	
6 native laborers, $5 each per month	360	
2 native boats, $5 each per month	120	
Hire of buffalo carts or pack train	500	
Subsistence, 10 men at $10 per month	1,200	
Outfit and instruments	1,500	
Miscellaneous expenses	920	
		5,800
Traveling expenses, 2 officers, Washington to Manila and return		800
Total, annually		11,000

It is proposed that the geologic reconnaissance shall be prosecuted for twelve months, and that a report similar to that which was prepared for Alaska in 1898 shall then be published.

In view of the strong probability that men engaged in these topographic and geologic surveys in the Philippines will be ill from time to time, it is suggested that special provision be made to continue their pay when sick beyond the limit set for more salubrious regions.

Recommendations for appropriations for these surveys follow at the close of this report.

CUBA.

Physical conditions.—Of the 45,000 square miles comprised in Cuba and its adjacent keys, one-fourth is said to be mountainous, three-fifths are plains, valleys, and gentle slopes, and the remainder is swamp. The central plains of the provinces of Habana, Matanzas, and part of Santa Clara are favorably conditioned for survey operations. Pinar del Rio is somewhat less easy to map. The eastern part of the island, comprising Santiago, Puerto Principe, and part of Santa Clara, presents relatively considerable difficulties. The season suitable for field work extends from November to April, inclusive.

Existing maps.—Maps of Cuba and its keys are said to be compilations of local surveys of doubtful accuracy, not controlled by triangulation. Although they are on a large scale they exhibit only the plan of towns, roads, and streams without statement of relative elevations. When the Coast and Geodetic Survey shall have executed the triangulation of the coast, the control thereby afforded will be available and may be extended into the interior.

Occasion for topographic maps.—It is expected that Cuba will enter upon an era of development. In agriculture, engineering, sanitation, water supply, and mining, topographic maps are needed now to guide investment of public and private funds. The most urgent need is for a general topographic map, accurately controlled by triangulation, on a moderate scale of 4 miles to the inch, and contoured to show differences of elevation of 50 to 200 feet, according to the degree of relief. Scarcely less urgent may be the demand for topographic maps on a larger scale in those thickly populated districts where development is intense. For some portions of the island the preliminary map, on the scale of 4 miles to an inch, may long suffice. Elsewhere maps on the relatively large scale of 2 or even 1 mile to an inch, delineating with great detail natural and cultural features, will be required.

Estimate of cost for topographic work.—For the general map (scale 4 miles to an inch) the cost may be estimated, approximately, at $2 per square mile, or $90,000 for the island. For this amount there would be secured triangulation to control future surveys on a large scale. Leveling is not proposed in this preliminary survey. Elevations are to be determined in connection with the triangulation. The rate of execution is estimated at 5,000 square miles for each party employed one season. The survey would thus occupy three parties three years.

Topographic maps on larger scale may follow as conditions require and permit their preparation. In the thickly settled plains and uplands the scale recommended for Porto Rico (1 mile to an inch, contours 20 to 50 feet apart) should be adopted. Such surveys, with appropriate leveling, may be executed for $10 per square mile. In mountainous and thinly settled districts a map on the scale of 2 miles to an inch, with appropriate contour interval, will be adequate. Its cost should be not far from $7 per square mile.

Geologic survey of Cuba.—The preparation of the general map of the island should be actively followed by a geologic reconnaissance adapted to the same moderate scale and immediate need for reliable information. More detailed general surveys may be undertaken in the future by any permanent government of the island.

The cost of the geologic reconnaissance can not be accurately foreseen. Areal mapping on the scale of 4 miles to an inch should be executed for $1 per square mile. This would result in general information to direct future investigations of the soils, to assist exploration for special mineral resources, including building stones and road metal, and to serve as a basis for more elaborate surveys. In addition to the geologic reconnaissance, careful measurements of the streams should be inaugurated.

Suggestions for organization of the topographic and geologic surveys described follow at the close of this report.

CADASTRAL SURVEYS.

Attention is respectfully called to the fact that the surveys herein proposed are topographic and geologic surveys, which are not designed to locate or measure tracts of land as property. Cadastral surveys to accomplish that purpose would be much more expensive and tedious. But the proposed topographic surveys will afford numerous points, precisely marked by monuments, to which bounds may in the future be referred.

RECOMMENDATIONS.

IN GENERAL.

Personnel.—The preceding estimates are based upon the experience of the United States Geological Survey in making surveys through its trained topographers and geologists. It is recommended that the peculiar qualifications of this corps be utilized in insular surveys, so far as may be compatible with the proper execution of work required in the United States and Alaska.

Administration.—The Federal Government is now conducting surveys in cooperation with several States, through the administration of the Director of the Geological Survey, subject to approval by the Secretary of the Interior. The Director, under whose immediate instructions the surveys are made, is responsible to the cooperating State for satisfactory results. It is recommended that immediate administration of the proposed topographic and geologic surveys be similarly intrusted to the Director of the Geological Survey, who shall be responsible for efficient execution of the plans.

PORTO RICO.

It is recommended that there be provided for surveys of Porto Rico the sum of $16,000, to be expended as follows:

For topographic surveys (including salaries of one topographer and two assistant topographers from the United States, wages of camp hands and subsistence in Porto Rico, and transportation)	$10,000
For geologic reconnaissance (including salary of one geologist from the United States, wages of camp hands and subsistence in Porto Rico, and transportation and office work)	6,000
Total	16,000

HAWAIIAN ISLANDS.

It is recommended that there be provided for surveys of the Hawaiian Islands the sum of $22,000, to be expended as follows:

For topographic surveys (including salaries of one topographer, two assistant topographers, field expenses, and transportation)	$10,000
For geologic surveys (including salaries of one geologist from the United States, one clerk, field and office expenses, and transportation)	12,000
Total	22,000

PHILIPPINES.

It is recommended that there be provided for surveys in the Philippines the sum of $50,000, to be expended as follows:

For topographic surveys (including salaries of three topographers, three assistant topographers, field and office expenses in the Philippines, and transportation)	$39,000
For geologic reconnaissance (including salaries of one geologist and one assistant topographer, field expenses in the Philippines, and transportation)	11,000
Total	50,000

CUBA.

It is recommended that there be provided for surveys of Cuba $36,000, to be expended as follows:

For topographic surveys (including salaries of three topographers and six assistant topographers from the United States, wages of camp hands and subsistence in Cuba, transportation, and office work)	$30,000
For geologic reconnaissance (including salary of one geologist from the United States, wages of camp hands and subsistence in Cuba, transportation, and office work)	6,000
Total	36,000

SUMMARY OF RECOMMENDATIONS.

The foregoing recommendations of appropriations for insular surveys are as follows:

For topographic and geologic surveys of the island of Porto Rico	$16,000
For topographic and geologic surveys of the Hawaiian Islands	22,000
For topographic and geologic surveys of the Philippines	50,000
For topographic and geologic surveys of Cuba	36,000
Total	124,000

ACKNOWLEDGMENTS.

As in previous years, various Government bureaus cordially cooperated with the Survey. These include the Smithsonian Institution, the National Museum, the Coast and Goedetic Survey, the General Land Office, the Division of Forestry of the Department of Agriculture, and the Government Printing Office. The members of the Survey continued to work harmoniously and faithfully. Special mention is made of the services of the chief clerk and the chief disbursing clerk, who took charge of the administrative and business affairs of the Survey during the Director's absence in the field in the season of 1899, and of the Editorial Division, in which an unusual amount of exacting work was satisfactorily accomplished.

Mention is also made of the efficient work of the Division of Engraving and Printing, and of the special methods devised by its chief and his assistants, whereby a large amount of time and money is saved the Government.

PLAN OF OPERATIONS.

The plan of operations for the fiscal year 1899–1900 was laid before the Secretary of the Interior on May 2, 1899, and was approved by him on May 3, 1899. This detailed plan is on file in the Department. The work of the year, hereinafter reviewed, was executed in conformity with the plans submitted and approved.

APPROPRIATIONS.

For and during the fiscal year 1899–1900 there was appropriated for the work of the United States Geological Survey the sum of $834,240.89. The acts making the appropriations set apart separate amounts for specific branches of work and for the salaries of persons connected with these branches. For convenience of reference these separate appropriations are here brought together and classified.

The legislative, executive, and judicial act contained the following items:

For salaries of Director, chief clerk, chief disbursing clerk, librarian, and photographer, together with clerks, messengers, watchmen, et al	$31,390.00
For rent	11,200.00
Total	42,590.00

The sundry civil act included the following items:

For pay of skilled laborers, etc		13,000.00
For topographic surveys	$240,000.00	
For pay of two geographers and two topographers	9,200.00	
Total for topographic work		249,200.00
For geological surveys	110,000.00	
For pay of four geologists	13,700.00	
Total for geologic work		123,700.00
For paleontologic researches	10,000.00	
For pay of two paleontologists	4,000.00	
Total for paleontologic work		14,000.00
For chemical and physical researches	7,000.00	
For pay of one chemist	3,000.00	
Total for chemical work		10,000.00

For general investigations in Alaska	$25,000.00
For gauging streams and determining water supply	50,000.00
For the preparation of illustrations	14,000.00
For preparation of report on mineral resources	30,000.00
For purchase of books and distribution of documents	2,000.00
For engraving and printing maps	60,000.00
For rent	6,200.00

There was appropriated in the same act, for engraving, printing, and binding publications of the Geological Survey, $37,000; this sum to be disbursed, not by the Geological Survey, but by the Public Printer. The items are as follows:

For engraving illustrations for report of Director	$7,000.00	
For engraving illustrations for monographs and bulletins	10,000.00	
For printing and binding monographs and bulletins	20,000.00	
Total for engraving, etc		37,000.00

Furthermore, the same act contained the following special appropriations:

Special appropriation for the survey of forest reserves	130,000.00

Any balance of appropriation for surveying the boundary line between Idaho and Montana unexpended June 30, 1899, reappropriated for fiscal year 1900.

The deficiency bill approved March 30, 1900, contained the following items:

For engraving and printing the geological maps of the United States	$2,500.00	
For gauging streams, etc	20,000.00	
		22,500.00

The deficiency bill approved June 6, 1900, contained the following items:

For maps of Alaska	$18.50	
For irrigation investigations, Gila River	119.95	
For payment for transmission of public documents through Smithsonian Exchange, fiscal year 1900	4,912.44	
		5,050.89
		834,240.89

ORGANIZATION.

For convenience of administration, the following scheme of organization of the work and business of the Survey was adopted some years ago. By this scheme the work is primarily divided into four branches, in each of which there are a number of divisions. The organization as here given was in effect during the year to which this report pertains, but, as explained on pages 19–22, a reorganization of the Geologic Branch took effect July 1, 1900.

Organization of Geological Survey during fiscal year 1899–1900.

Branch.	Division.
Geologic	Geology.
	Paleontology.
	Chemistry.
	Hydrography.
	Mineral Resources.
Topographic	Triangulation.
	Topography.
	Geography and Forestry.
Publication	Illustrations.
	Editorial.
	Engraving and Printing.
Administrative	Documents, Correspondence, and Records.
	Disbursements and Accounts.
	Library.

ALLOTMENTS.

ALLOTMENTS TO GEOLOGIC WORK.

As stated above, the total appropriation for geologic work for 1899–1900 was $123,700. The following table exhibits the allotments that were made to the heads of the several geologic parties:

Allotments to geologic parties.

Party.	Amount.
Executive office	$6,080
Shaler, N. S. (Massachusetts)	1,000
Emerson, B. K. (Massachusetts)	250
Dale, T. N. (Massachusetts and Vermont)	2,300
Wolff, J. E. (Massachusetts, Vermont, and New Jersey)	400
Williams, H. S. (Massachusetts, Connecticut, Maine, Virginia, and West Virginia)	1,000
Kemp, J. F. (New York)	300
White, David (Pennsylvania)	2,300
Campbell, M. R. (West Virginia, Ohio, and Tennessee)	3,600
Hayes, C. W. (Georgia, Alabama, and Tennessee)	2,900
Keith, A. (Tennessee, North Carolina, and Virginia)	3,250
Clark, W. B. (Maryland)	1,000

Allotments to geologic parties—Continued.

Party.	Amount,
Van Hise, C. R. (Michigan and Minnesota)	$9,000
Hill, R. T. (Texas)	4,500
Vaughan, T. W. (see Paleontology, p. 93)	1,600
Taff, J. A. (Indian Territory and Arkansas)	3,700
Emmons, S. F. (South Dakota and Colorado)	13,500
Cross, Whitman (Colorado)	6,200
Weed, W. H. (Montana, Tennessee, North Carolina, and Virginia)	3,400
Hague, Arnold (Yellowstone National Park)	2,000
Lindgren, Waldemar (Montana, Idaho, and Washington)	5,000
Spurr, J. E. (Utah, Nevada, and California)	5,800
Branner, J. C. (California)	750
Turner, H. W. (Nevada and California)	4,700
Diller, J. S. (Oregon)	6,100
Smith, G. O. (Washington)	5,350
Gilbert, G. K. (Washington)	6,000
Chamberlin, T. C. (northern United States)	3,500
Becker, G. F. (detailed to Philippine Islands, in cooperation with War Department)	4,000
Willis, Bailey (Washington and field supervision)	5,100
Director (field expenses)	1,500
Stose, G. W. (map editing)	2,150
Eldridge, G. H. (see Mineral Resources, p. 102)	2,900
Contingent	2,570
Total	123,700

ALLOTMENTS TO PALEONTOLOGIC WORK.

The total appropriation for paleontologic work for 1899–1900 was $14,000, which was allotted to the various sections of the work as follows:

Allotments to paleontologic work.

Section.	Amount.
Paleozoic	$2,900
Mesozoic	2,000
Cenozoic	2,300
Paleobotanic	4,700
Contingent	2,100
Total	14,000

ALLOTMENTS TO TOPOGRAPHIC WORK.

The appropriation for topographic work for 1899–1900 was $249,200, which was allotted to the several sections of the work as follows:

Allotments to topographic work.

Section.	Amount.
Administration	$16,800
Atlantic section	90,000
Central section	50,000
Rocky Mountain section	35,500
Pacific section	37,500
Instruments, repairs, etc	13,000
Contingent	6,400
Total	249,200

ALLOTMENTS TO FORESTRY WORK.

The appropriation for the surveys and investigations of the forest reserves was $130,000, which was allotted as follows:

Allotments to forestry work.

Section.	Amount.
Topographic surveys:	
Rocky Mountain section	$45,000
Pacific section	45,000
Forest surveys	25,000
Office expenses	9,600
Contingent fund	5,400
Total	130,000

MISCELLANEOUS ALLOTMENTS.

CHEMISTRY.

For pay of all persons connected with the chemical work, and for the purchase of chemical supplies, apparatus, etc., the entire appropriation of $10,000 was allotted.

HYDROGRAPHY.

The appropriation of $50,000 for hydrography was allotted as follows: $30,000 to the measurement of streams, including survey of reservoir sites, and the remainder, $20,000, to the preparation of reports upon the methods of utilizing the water supply and to investigations of underground currents and artesian wells. (See Part IV of this Annual Report and the series of Water-Supply Papers.)

The appropriation was apportioned by States as follows:

Apportionment of appropriation for hydrography, by States.

State or Territory.	Amount.
Alabama	$700
Arizona	2,100
California	3,000
Carolinas	2,200
Colorado	2,900
Georgia	1,600
Idaho	1,600
Kansas	2,500
Maryland	1,100
Michigan	500
Montana	1,700
Nebraska	2,600
Nevada	1,300
New England	1,300
New Mexico	2,000
New York	2,000
North Dakota	1,900
Oklahoma	200
Oregon	1,400
Pennsylvania	1,500
South Dakota	5,800
Texas	2,000
Utah	1,900
Virginias	1,500
Washington	1,600
Wyoming	3,100
Total	50,000

MINERAL RESOURCES.

The entire appropriation for the preparation of the report on mineral resources, $30,000, was allotted to the gathering and compilation of statistical data for the calendar year 1899 and the preparation of a report on the same, which is published as Part VI of this Annual Report.

ENGRAVING AND PRINTING MAPS, ETC.

The appropriations for engraving and printing maps, the purchase of books and distribution of documents, the preparation of illustrations, pay of skilled laborers, etc., and the special appropriations, were expended for the specific purposes named in the act.

WORK OF THE YEAR.

As has already been stated, the general organization of the Survey, by branches and divisions, was continued unchanged until the end of the fiscal year. The appoved plan of operations was carried out in all essential particulars, the variations being such as were found necessary to meet conditions that could not be foreseen.

GEOLOGIC BRANCH.

Division of Geology.

The following is a summary of the geologic operations, arranged according to geologic and geographic provinces, proceeding from the Atlantic westward:

SUMMARY OF GEOLOGIC WORK, BY PROVINCES.

Atlantic Coastal Plain.—Work in the Mesozoic and later formations of the Atlantic Coastal Plain was carried on in Cape Cod (Shaler), in Maryland and Virginia (Clark, Darton), and in Texas (Hill).

Appalachian Range (pre-Cambrian and metamorphic rocks).—In the district extending from Maine to Georgia and comprising formations long supposed to be Archean, but now recognized to be only in part pre-Cambrian and in part Paleozoic, detailed and elaborate investigations were carried on at various points, coordinated under the general supervision of Professor Van

Hise. (Emerson, Dale, Kemp, Hobbs, Williams, Wolff, Bascom, Mathews, Keith.)

Appalachian Valley and plateau region.—Progress was made in the study and description of the unmetamorphosed Paleozoic rocks of the Appalachian Valley and the plateau region extending to the valley of the Mississippi, and several folios relating to quadrangles in the folded zone and also to the less disturbed districts of the coal field have been prepared for publication. No active field operations are now in progress in the unmetamorphosed Paleozoic rocks older than the Carboniferous, except incidentally to the investigation of the Coal Measures. The work under Mr. M. R. Campbell, aided by Mr. David White, paleobotanist, upon the stratigraphy, structure, and economic geology of the Coal Measures was energetically pushed; additional material of the highest degree of accuracy was prepared for publication, and data on newly surveyed areas were accumulated. (Hayes, Keith, Campbell, White.)

Lake Superior iron region.—Surveys of the iron-bearing formations of Lake Superior, under Prof. C. R. Van Hise, were continued in the Menominee, Vermilion, and Mesabi districts. Monographs on these districts are in preparation, and a report on the Menominee district has lately been published as a folio of the Geologic Atlas (folio 62). (Van Hise, Clements, Bayley, Leith.)

Glaciated region.—Field investigations of the glacial deposits of Wisconsin, Illinois, and Indiana, under Prof. T. C. Chamberlin, were continued, as was also the preparation of monographs on the different glacial lobes. (Chamberlin, Leverett, Alden.)

Arkansas-Indian Territory.—The surveys of the coal field of Indian Territory were continued, covering the Tuskahoma and part of the Sallisaw quadrangles, and there were prepared for publication as parts of the Geologic Atlas the maps and sections for the Coalgate, Atoka, and McAlester folios, and the text for the Coalgate. In May an investigation of the Camden coal field, Arkansas, was made, and an important report thereon will be found in Part II of this Annual Report. (Taff.)

Texas.—The Rio Grande traverses the mountain region of Texas through a grand canyon which has hitherto baffled explorers. In the autumn of last year this canyon was successfully studied, and an important contribution to our knowledge of the geology of western Texas was thus made. (Hill.)

Great Plains and Black Hills.—Surveys in the Great Plains region had for their object chiefly the study of underground waters and the accumulation of stratigraphic data as means for determining the depth of artesian basins. The report on Nebraska, prepared the previous year, was succeeded last year by one on the southern Black Hills, in South Dakota and Wyoming. The same questions were studied in the Rapid, Mitchell, and Alexander quadrangles. (Darton, O'Harra, Todd.)

In the northern Black Hills the detailed study of the Spearfish quadrangle was carried out, with specially interesting results in regard to the phenomena of laccolithic intrusions. The mining district in the vicinity of Deadwood was carefully examined. (Emmons, Jaggar, Irving.)

Rocky Mountain province.—In the mountain ranges of western Idaho and eastern Washington a reconnaissance was carried out with special reference to the Bitterroot Range and the Cœur d'Alene district. (Lindgren, Stose.)

The investigation of the Butte mining district, with a view to monographic report on the mineral deposits, and the survey of the adjacent Elkhorn district, Montana, occupied the field season. In connection with these studies of copper deposits the copper mines of the Appalachian region were visited. (Emmons, Weed.)

In the Silverton and Rico districts, Colorado, investigations of the structural geology and genesis of ore deposits were continued. (Emmons, Ransome.)

The stratigraphy and structure of the San Juan Mountains were further investigated, with special reference to the Silverton quadrangle. The Telluride folio was published, and the La Plata folio is nearly ready for distribution. (Cross.)

Great Basin province.—The Great Basin region of southern Nevada and southern California was traversed from Eureka by a zigzag route 2,000 miles in length, touching the Sierra Nevada on the west and Pioche on the east, and extending southward to the San Bernardino Valley, California. (Spurr.)

Pacific coast.—In Washington the surveys of the Cascade Range were extended by the survey of the Mount Stuart quadrangle and the partial survey of the Snoqualmie quadrangle, and the Tacoma folio was completed and published. (Willis, Smith, Mendenhall.)

In Oregon, work in the Roseburg and Coos Bay quadrangles having been completed and the reports advanced to publication, surveys were continued in the Port Orford quadrangle, covering the southwestern portion of the Klamath Mountains. (Diller.)

In the Sierra Nevada and adjacent ranges a survey was made of the Silver Peak quadrangle, Nevada, and additional work was done on the Yosemite and Mount Lyell quadrangles, California, in preparation for a final survey. (Turner.)

In the vicinity of San Francisco the study of the Coast Ranges was continued and material was prepared for publication as folios, as planned and described in the last Annual Report. (Lawson.)

A general study of the asphalts was conducted as part of an investigation of similar deposits throughout the United States for the Division of Mineral Resources. (Eldridge.) A reconnaissance was made of the Santa Lucia Range from Monterey to San Luis Obispo. (Willis, Fairbanks.)

A detailed statement of the work according to parties follows:

DETAILED STATEMENT OF GEOLOGIC WORK, BY REGIONS AND PARTIES.

NEW ENGLAND REGION.

Shaler party (*Massachusetts*).—In Massachusetts, Prof. N. S. Shaler, assisted by Mr. J. B. Woodworth, continued the study of the geology of the Marthas Vineyard and Cape Cod districts, in the Gay Head, Marthas Vineyard, Wellfleet, Chatham, and Yarmouth quadrangles. Professor Shaler was also engaged in the preparation of a memoir on coast lines. During the year Monograph XXXIII, Geology of the Narragansett Basin, was published, and an article on the Richmond coal basin appeared in Part II of the Nineteenth Annual Report.

Emerson party (*Massachusetts.*)—Prof. B. K. Emerson's field work was interrupted during the summer by a trip to Alaska and Bering Sea, as one of the members of the Harriman expedition. The time available for field work was devoted to a resurvey of the western part of the Ware quadrangle, where questions of the relations of the crystalline rocks had been only imperfectly settled. In company with Prof. W. H. Hobbs he adjusted the geologic boundaries between the Housatonic quadrangle and the 30-minute quadrangle south of it.

In the office much time was devoted to reading the proof of Bulletin 159, The Geology of Eastern Berkshire County, and of part of the Housatonic folio. The map, text, and part of the sections of the Ware folio were completed, and the map of the Quinsigamond folio. Work was also done on a monograph of Worcester County. The original manuscript maps for part of the Housatonic folio (Berkshire County) are on file for publication.

Dale party (*Massachusetts and Vermont.*)—Prof. T. Nelson Dale continued surveys in the Cohoes, Hoosick, Fort Ann, and Equinox quadrangles, the total area mapped during the year being 291 square miles, with incidental work in the Greylock and Bennington quadrangles, comprised within the area of the Taconic folio. In all, three months were spent in field work. He was assisted by Mr. F. H. Moffit, geologic aid.

Office work comprised the preparation of the Cohoes, Fort Ann, Equinox, Cambridge, Pittsfield, Hoosick, Berlin, Greylock, and Bennington sheets, and text for the Taconic folio. A descriptive list was also prepared of 119 negatives sent in during the years 1887 to 1899. In April Professor Dale visited Washington for conference with the Director and other geologists. At the close of the year he had begun the preparation of a paper on the leading characteristics, both physiographic and geologic, of the Taconic region.

Wolff party (*Massachusetts, Vermont, and New Jersey*).—Prof. J. E. Wolff spent some time in the preparation of material relating to the Bennington (Vermont) and Greylock (Massachusetts) quadrangles, to form part of the Housatonic folio of the Geologic Atlas. He consulted with Professor Dale in regard to boundaries, and devoted considerable attention to the arrangement of specimens and material from the Franklin Furnace (New Jersey) quadrangle.

Williams party (Massachusetts, Connecticut, Maine, Virginia, and West Virginia).—Prof. H. S. Williams, with the assistance of Dr. H. E. Gregory, made an examination of crystalline areas in Massachusetts bordering on the north the Farmington quadrangle of Connecticut, and consultations in the field were held with Professors Emerson and Hobbs with a view to establishing uniformity of classification for several quadrangles. Dr. Gregory mapped the crystallines of the Farmington quadrangle and completed field work for all the crystallines on the western side of the Triassic. A beginning was also made on the crystallines on the eastern side, north of Middletown. He also made some progress in petrographic study and description of rocks of Aroostook County, Maine, and of the Farmington quadrangle, Connecticut.

Within the year Professor Williams completed the preliminary report on the Paleozoic rocks and faunas of Aroostook County, Maine, and it was published as Bulletin 165. Of his preliminary report on the Paleozoic faunas of northern Arkansas 107 pages were completed, and some preliminary work was accomplished on the faunas from West Virginia and Virginia. He also made considerable progress in the preparation of figures to illustrate fossils of Maine and other regions, and experiments in photographic preparation of such figures were markedly successful. Furthermore, there were published by Professor Williams two papers setting forth results of an investigation of the Chapman sandstone fauna, revealing its significance in determining the Silurian-Devonian boundary for North America.

Hobbs party (Connecticut).—Under the direction of Prof. C. R. Van Hise, Prof. W. H. Hobbs, assisted by Mr. H. H. Robinson, spent two and one-half months in areal work in the Litchfield, Danbury, and Derby quadrangles, Connecticut, and in detailed study of the structure of the Newark formation of the Pomperaug Valley, Connecticut. The general purpose of Professor Hobbs's work is to extend mapping of the metamorphosed crystalline rocks of southwestern Connecticut, adjoining on the west the work of Professor Williams. But in the Pomperaug Valley, beds of Juratrias age present within a limited area peculiarly interesting relations of faulting and topography, to which special study was given.

Kemp party (*New York*).—Prof. J. F. Kemp, assisted by Mr. Alfred T. Child, and later by Mr. Morrison B. Young, continued the survey of the Ausable and Lake Placid quadrangles, Essex County, New York, the field season lasting two months. Several days were spent in conference in the field with Professor Dale upon the crystalline rocks in the northwestern portion of the Fort Ann quadrangle. The mapping of this area was completed in June.

During the winter season the office work was interrupted by the illness of Professor Kemp, and the material has not been submitted for publication.

APPALACHIAN REGION.

White party (*Pennsylvania*).—Mr. David White spent two months in collecting material for the construction of a paleontologic section of the Allegheny series in the type region of western Pennsylvania. A portion of the winter was spent in an examination of material from the Allegheny series and a comparison of fossils with those from the Kanawha formation in southern West Virginia. A preliminary report on this subject was published in the bulletin of the Geological Society of America. Over seventy-five collections of plants from Carboniferous and Permian beds of West Virginia, Kentucky, Michigan, Kansas, and Indian Territory were examined and reported upon to various areal geologists in the field. Some time was devoted to the classification of a considerable amount of Paleozoic plant material in the National Museum. All other available time was given to advancing the study and description of the plants from the Pottsville formation in the Appalachian province. A report on The Stratigraphic Succession of the Fossil Floras of the Pottsville Formation in the Southern Anthracite Coal Field was published in Part II of the Twentieth Annual Report.

Campbell party (*West Virginia, Ohio, and Tennessee*).—Mr. M. R. Campbell commenced the survey of the Sutton (West Virginia) quadrangle, but was unable to complete it, a more refined topographic base controlled by precise levels being found necessary on account of the economic value of the coal. He revisited the Raleigh quadrangle, for additional work in the northern part, to settle the stratigraphic position of important coal beds. Similar work was done in the southwestern corner of the Kanawha Falls quadrangle. The Bristol quadrangle was visited for the purpose of determining questions concerning the correlation of coal outcrops, and the return journey was by way of Ironton, Ohio, and Huntington, West Virginia, in order that more definite information concerning alluvial deposits in the abandoned valley of Kanawha River might be obtained.

In the office descriptive texts for the Bristol folio, relating to parts of Scott and Washington counties, West Virginia, and Sullivan County, Tennesse; for the Danville folio, Vermilion County, Illinois; and for the Huntington and Charleston folios, Wayne, Lincoln, Cabell, and Kanawha counties, West Virginia, were written, the geologic boundaries of the Charleston folio were revised, and much work on geologic maps, sections, etc., for the different folios was done.

Hayes party (Georgia, Alabama, and Tennessee).—Mr. C. Willard Hayes devoted most of the year to the preparation for publication of the folios for the Dalton, Cartersville, and Marietta quadrangles in Georgia; the Tallapoosa and Rome quadrangles, in Georgia and Alabama, and the Anniston and Fort Payne quadrangles, in Alabama. In July he went to western Tennessee and made a preliminary examination of the brown phosphate deposits, the results being published in the Twentieth Annual Report, Part VI. In the work on the paleontology of the brown phosphates Mr. Hayes was assisted by Mr. E. O. Ulrich. The month of March was spent in Arkansas in an examination of the bauxite deposits, on which a report appears in Part VI of this Annual Report.

Mr. Hayes was appointed chairman of the Committee in Charge of the Photographic Laboratory, which was discharged on January 1, 1900, and since then he has served as chairman of the Advisory Committee on the laboratory.

Following is a list of papers prepared for publication within the last year:

Physiography of the Nicaragua Canal route: Nat. Geog. Mag., July, 1899.

A reconnaissance of the Tennessee phosphate fields: Twentieth Ann. Rept. U. S. Geol. Survey, Pt. VI, 1899.

The Nicaragua Canal route: Science, July, 1899.

Geological relations of the iron ores in the Cartersville district, Georgia: Trans. Am. Inst. Min. Eng., February, 1900.

An assumed inconstancy in the level of Lake Nicaragua: Nat. Geog. Mag., April, 1900.

Ice cliffs on White River, Yukon Territory (with A. H. Brooks): Nat. Geog. Mag., May, 1900.

The relation of biology to physiography (with M. R. Campbell): Science, August 3, 1900.

The bauxite deposits of Arkansas: Twenty-first Ann. Rept. U. S. Geol. Survey, Pt. VI, 1900.

The Tennessee white phosphates: Twenty-first Ann. Rept. U. S. Geol. Survey, Pt. VI, 1900.

Keith party (Tennessee, North Carolina, and Virginia).—Mr. Arthur Keith spent four months of the last fiscal year in the field, in detailed work in the Maynardville quadrangle, Tennessee, and in the Cranberry and Cherokee districts of North Carolina, Tennessee, and Virginia, the work in the Cranberry district receiving the most attention. The structure and stratigraphy of the Cambrian and pre-Cambrian rocks involved therein were studied in the Wytheville and Abingdon (Virginia) quadrangles and in the Morganton, Mount Mitchell, and Roan Mountain (North Carolina) quadrangles, the phenomena of metamorphism also receiving careful study. A further study of the old lavas and fragmental deposits in the Abingdon and Wytheville quadrangles reaffirms their pre-Cambrian age. A special study was made of folded fault planes and fan structure in the Cranberry and Cherokee districts, these unusual structures being found to be typical of the mountain region of North Carolina.

In the course of office work notes were platted and areal geologic work was brought up to date as far as possible. The manuscript of the Maynardville (Tennessee) folio was slightly revised and is now in process of publication. The manuscript of the Cranberry (North Carolina) folio has also been submitted for publication.

Bascom party (*Pennsylvania*).—Under the direction of Prof. C. R. Van Hise, Dr. Florence Bascom finished the areal mapping of the metamorphic rocks for the special Philadelphia folio of the Geologic Atlas. Much of her time in the office has been spent in the petrographic study of the material collected in the field and in drawing sections for the folio, which is practically ready for presentation.

ATLANTIC COASTAL PLAIN REGION.

Clark party (*Maryland*).—Prof. William B. Clark, State geologist of Maryland, assisted by Messrs. G. B. Shattuck, A. Bibbins, L. C. Glenn, and G. C. Martin, continued the investigations of the Cretaceous and Tertiary formations of eastern and southern Maryland. Special attention was given to the study of the Eocene deposits and their contained fauna, and the monograph on this subject is nearly ready for publication. Dr. Shattuck continued work on the Neocene deposits, and the delimitation of the boundaries of the several formations is now rapidly approaching completion. The Pleistocene formations have been carefully studied, and a comprehensive scheme of classification has been established.

Professor Clark's work is carried on under an agreement securing cooperation between the State survey and the United States Survey, in accordance with which the latter will receive for publication in the Geologic Atlas the results of these studies in the Coastal Plain.

INTERIOR OR MISSISSIPPI REGION.

Van Hise party (*Michigan and Minnesota*).—Under the supervision of Prof. C. R. Van Hise, field work in the Vermilion district of Minnesota was continued by Mr. J. Morgan Clements, assisted by Mr. C. K. Leith. The iron formations were carefully delimited, and studies of the ore deposits were made with special reference to their mode of occurrence and origin. A careful study of the structure of the Vermilion district was made, and a reconnaissance survey of an adjacent area in the Province of Ontario was necessary.

Mr. W. S. Bayley, under Professor Van Hise's direction, continued work in the Menominee iron-bearing district of Michigan. The detailed work was completed with the exception of making magnetic surveys of certain belts which possibly may be underlain by the iron-bearing formation.

Professor Van Hise himself devoted the field season largely to a study of the unsolved structural problems of the Vermilion and Menominee districts, in addition to which he spent some time in the far West in general studies having reference to problems of metamorphism.

In the office Mr. Clements gave his entire time to the preparation of a monograph on the Vermilion district, the first draft of which is completed. Mr. Bayley gave the first part of the year to work on a special advanced report on the Menominee district, published as folio 62 of the Geologic Atlas. The second half of the year he continued preparation of a monograph on the Menominee district, the completion of which will require another year. Professor Van Hise prepared a chapter on the general geology of the Vermilion district, to accompany the monograph on that area; and a general paper on the iron-ore deposits of the Lake Superior region was prepared for this Annual Report (Part III). The remainder of his time was given to the monograph on metamorphism. Mr. Leith continued the summarization of North American pre-Cambrian literature for a forthcoming bulletin of the Survey, but most of his time was given to an investigation of the causes of cleavage of the crystalline schists and to general office work.

Darton party (South Dakota and Wyoming).—Mr. N. H. Darton was engaged during the field season in studies of the stratigraphy and structure of the Paleozoic, Mesozoic, and overlapping Tertiary formations of the Black Hills, South Dakota. This work was done under the auspices of the Division of Hydrography, and one of its chief purposes was to obtain data for a report on the underground waters of the Black Hills region, which has been prepared for this Annual Report (Part IV). Detailed geologic mapping was carried on in the Hermosa and Newcastle quadrangles, and a reconnaissance was made of the Edgemont and Sundance quadrangles. Special attention was given to a study of the coal fields of Cambria, Wyoming, and to the prospects for petroleum in the vicinity of Newcastle, Wyoming. Gypsum deposits were also examined, and it was found that the fuller's earth at Fairburn, South Dakota, underlies a wide area, much of the material appearing to be of economic value. A bed of volcanic ash was also found near Argyle, South Dakota.

Under the direction of Mr. Darton, Prof. C. C. O'Harra was employed in mapping the geology of a portion of the Rapid quadrangle, and Profs. J. E. Todd and C. M. Hall spent several months in the field studying the geology and underground waters in the Mitchell, De Smet, and Alexandria quadrangles.

During the winter, in office, the report on the geology and underground waters of the Black Hills and adjacent region, already mentioned, was prepared, the maps and text for the Juratrias of the New York City folio of the Geologic Atlas were prepared, and the Parker, Alexandria, Olivet, and Mitchell sheets, mapped by Profs. J. E. Todd and C. M. Hall, were edited.

Hill party (Texas).—Mr. R. T. Hill was engaged from September 1 to November 1 in field work in the trans-Pecos region of Texas. A reconnaissance was made of the Big Bend country, and the results of this expedition were of great interest, both geographically and geologically. Where the Rio Grande traverses the mountain region of Texas it flows through a grand canyon, in which several parties, including those of the Boundary surveys, turned back after vain efforts to traverse it. In the autumn of last year Mr. Hill successfully studied this canyon, making a trip of nearly 300 miles on the Rio Grande. This led to an important contribution to the geology of western Texas.

Office work was devoted to the compilation and publication of a geographic map of Texas (published in April); to the preparation of a physical geography of Texas, to be published as Topographic Folio No. 3; a report on The Cretaceous Formations of the Black and Grand Prairies of Texas, their Geologic and Topographic Relations, with Special Reference to Artesian Waters, which it is hoped can be published as Part VII of this Annual Report; and the Austin folio of the Geologic Atlas, which will be published as soon as practicable.

Vaughan, T. W., work of.—The work of Mr. T. Wayland Vaughan during the last fiscal year was purely paleontologic, and is referred to on page 93.

Taff party (Indian Territory and Arkansas).—Mr. J. A. Taff is engaged in detailed and precise surveys of the coal field of Indian Territory. During the field season, which lasted nearly six months, he was assisted by Mr. George I. Adams. The survey of the Tuskahoma quadrangle was completed, and the Winding Stair quadrangle and about one-half of the Sallisaw quadrangle were surveyed. In May Mr. Taff made an examination of a part of the Camden coal field, Arkansas.

During the winter office work consisted in compiling notes and making preliminary geologic maps for the Tuskahoma, Winding Stair, and Sallisaw quadrangles. Complete maps and sections for the Coalgate, Atoka, and McAlester folios were drawn, and the text for the Coalgate was written. A paper on the Geology of the Eastern Choctaw Coal Field, Indian Territory, was prepared for publication, and a report on the Camden coal field was submitted; both are published in Part II of this Annual Report. Three months during the winter Mr. Taff was assisted in office work by Mr. Adams. On June 1 Mr. Taff returned to the field.

Emmons party (South Dakota).—Mr. S. F. Emmons, assisted by Messrs. T. A. Jaggar, jr., J. M. Boutwell, and J. D. Irving, geologic assistants, was engaged in an investigation of the Black Hills, South Dakota. An areal and economic survey of the Spearfish quadrangle, in the northern Black Hills, was accomplished, and some parts of the Sturgis quadrangle were reviewed. Geologic observations were extended beyond the western border of the Spearfish quadrangle to include the Paleozoic areas of the Sundance quadrangle. The Spearfish quadrangle includes the most important and actively exploited ore-bearing areas of the Black Hills. The economic investigation was undertaken by Mr. J. D. Irving, under the direct supervision of Mr. Emmons.

In the office Dr. Jaggar prepared a valuable paper on The Laccolithic Intrusions of the Black Hills, accompanied by an appendix by Mr. Ernest Howe, on Experiments illustrating

Intrusion and Erosion. This is published in the present Annual Report, Part III. Mr. Boutwell laid down in great measure the geologic outlines of the Spearfish quadrangle. Mr. Irving's time was devoted to microscopic studies of the ores collected during the summer, and to preparing underground maps of the most important groups of mines. He has written a full description of the various ore deposits. All the material necessary for the double folio on the Spearfish and Sturgis quadrangles is ready for publication.

ROCKY MOUNTAIN REGION.

Emmons party (*Colorado*).—Under the direction of Mr. S. F. Emmons, and in cooperation with Mr. Whitman Cross, Mr. F. L. Ransome was engaged in an economic study of the mines of the Silverton quadrangle. These comprise a very important series of silver- and gold-bearing vein deposits, mostly in eruptive rocks. After a visit to the Unaweep district by Mr. Emmons, it was decided that a reconnaissance examination of the copper and uranium deposits in the region of the Uncompahgre Plateau, in western Colorado, should be undertaken by Messrs. Ransome and Spencer at the close of their work in the Silverton quadrangle. This was accomplished during the month of October.

During the winter season Mr. Ransome studied microscopically the material gathered, and prepared reports on the region examined. The Mother Lode (California) folio of the Geologic Atlas, which was prepared by Mr. Ransome after extensive studies of the lode, will be published early in the autumn.

The folio of the Tintic mining district, Utah, will be published early in the fiscal year, the work having been done by Messrs. George W. Tower and George Otis Smith.

Cross party (*Colorado*).—Mr. Whitman Cross, assisted by Mr. A. C. Spencer, assistant geologist, and by Messrs. Ernest Howe and R. D. George, volunteer assistants, completed the study of the Rico Special quadrangle in the month of July. The months of August and September were spent in the survey of the Silverton quadrangle, which adjoins the Telluride on the east, and is in the heart of the volcanic complex of the

San Juan Mountains. This survey was not completed, owing to the close of the season. Before returning to Washington, Mr. Spencer made an examination of the geology of the headwaters of the Rio Grande in the San Cristobal quadrangle, east of the Silverton, extending from Weminuche Pass to east of the Needle Mountains, and thence to the southeast corner of the Durango quadrangle, where a small amount of areal mapping was necessary to finish the Durango sheet.

The greater part of the winter and spring was occupied by Messrs. Cross and Spencer in the preparation of a paper on the Geology of the Rico Mountains, Colorado, for this Annual Report, Part II. The Rico sheet was also completed. Mr. Spencer was engaged for about a month in bibliographic work assigned to him by the Director. In the spring of 1900 he was assigned to an Alaskan party, and left Washington for Alaska early in May.

Mr. Cross served as a member of the Committee on the Photographic Laboratory, and after the discharge of that committee as member of the Advisory Committee on the laboratory. He also acted as chairman of the Committee in Charge of Petrographic Reference Collection, and as chairman of the Committee on Chemical Analyses of Rocks to November, 1899. Mr. Cross also prepared large collections from the Anthracite-Crested Butte and Silver Cliff districts for transfer to the National Museum.

Within the year the Telluride folio was issued, and the La Plata folio is nearly ready for distribution.

Weed party (*Montana, Tennessee, North Carolina, and Virginia*).—Mr. Walter H. Weed continued work in the Helena Special quadrangle, and, assisted by Dr. Joseph Barrell, made a special study of the ore deposits and intricate geology of the region near Elkhorn, Montana. Dr. Barrell being left to complete the areal survey of that region, Mr. Weed joined Mr. Emmons and made a reconnaissance trip to the Marysville district. New and extensive development work in the copper mines at Butte made it imperative that additional data should be secured for the monographic study of that district, and Mr. Weed spent the months of August, September, and October in this work, making several trips to Elkhorn to supervise the work of Dr. Barrell there.

In December a reconnaissance trip to the Ducktown, Tennessee, copper mines, and an examination of the newly opened copper properties belonging to the Union Copper Company at Goldhill, North Carolina, were made, as well as a short trip to the copper district of Person County, North Carolina, and Halifax County, Virginia. Linden, Virginia, was also visited for information concerning the native copper deposits in the sheeted basaltic rocks of that place. The results of these short trips were embodied in a paper entitled Type Copper Deposits of the Southern States, published by the American Institute of Mining Engineers.

A paper on Enrichment of Mineral Veins by Later Metallic Sulphides was prepared for the December meeting of the Geological Society of America and printed in its Proceedings. Later in the winter considerable time was devoted to the preparation of a paper on Sulphide Enrichment of Gold and Silver Veins, which has been printed in the Transactions of the American Institute of Mining Engineers. The months of February and March were devoted to office work upon the Butte, Montana, deposits, and in April a trip was made to Butte to continue observations of the copper veins. In June, office work upon the Elkhorn report was in progress, and a paper on The Mineral Vein Formation at Boulder Hot Springs, Montana, for this Annual Report (Part II), was finished. During the year the Little Belt Mountain and Fort Benton folios were issued, and an article on the Granitic Rocks of Butte, Montana, was published in the Journal of Geology.

Hague party (*Yellowstone Park*).—Mr. Arnold Hague was occupied entirely in office work, most of the time in the preparation of Part I of the monograph on the Yellowstone Park (Monograph XXXII), Part II having been published. He also served as chairman of a committee appointed to consider the scope of the 9-sheet geologic map of the United States.

Dr. T. A. Jaggar devoted considerable time to a petrographic study of the rocks of the Absaroka Range, his report to appear in Part I of the Yellowstone Park monograph.

Prof. W. A. Setchell, of the University of California, revised and returned his report on the plant life of the hydrothermal waters of the Yellowstone Park.

Lindgren party (*Montana, Idaho, and Washington*).—Mr

Waldemar Lindgren, after completing and handing in his report on the Silver City, De Lamar, and other mining districts of Idaho, published in the Twentieth Annual Report, Part III, proceeded to Hamilton, Montana, where he outfitted for a reconnaissance of the Bitterroot Range. On August 1 Mr. Lindgren was joined in the field by Mr. George W. Stose, assistant geologist and editor of geologic maps, who served as his assistant during August and September. Mines in the vicinity of Elk City, Idaho, were visited and carefully studied. During the month of September field work in Idaho was interrupted by special orders from the Secretary of the Interior for Mr. Lindgren to proceed to Spokane, Washington, to testify in a case affecting Government lands.

In the office Mr Lindgren devoted his time to the preparation of a paper on Metasomatic Processes in Fissure Veins, presented at the annual meeting of the American Institute of Mining Engineers. Much time was also given to a report on Certain Mining Districts in Washington.

The Colfax folio of the Geologic Atlas, submitted by Mr. Lindgren for publication, will be issued in the early autumn.

In April Mr. Lindgren obtained leave of absence for three months.

Spurr party (Utah, Nevada, and California).—Mr. J. E. Spurr was engaged in studies of the less known portions of the Great Basin region of Nevada and California, with a view to the filling of gaps in the geologic map of the United States and to ascertaining whatever might be of interest from a scientific or economic standpoint. His work was mainly in Nevada, making reconnaissance surveys of a large region, the starting point being Eureka. The route traversed the southern part of the State of Nevada several times and passed into adjacent regions of California, ending at San Bernardino, making an aggregate of over 2,000 miles of linear reconnaissance.

In the office the material obtained was worked over, and a reconnaissance map of southern Nevada and adjacent California, including the region southward from the fortieth parallel to a point south of the thirty-sixth parallel, was prepared. A report to accompany this map is under way.

PACIFIC REGION.

Branner party (California).—Prof. J. C. Branner was absent on a scientific expedition to Brazil during the season available for field work. By his request his allotment was applied to the work of Dr. H. W. Fairbanks for the San Luis folio, which will describe the San Luis Obispo, Cayucos, Arroyo Grande, and Port Harford quadrangles, in southern California. Dr. Fairbanks, after accompanying Mr. Willis on a trip from Monterey through the Santa Lucia Range, spent several weeks in the field studying the physiography and structural geology of the district. He thoroughly revised the text of the San Luis folio and submitted it, with maps, for further consideration by the editor.

Lawson party (California).—Prof. A. C. Lawson continued his investigation of the geology of the coast ranges near San Francisco, with special reference to the vicinity of Monte Diablo. In the office he was engaged in the preparation of manuscripts for the folios in which the surveys of the six 15-minute quadrangles covered by his work are to be published.

Turner party (Nevada and California).—Mr. H. W. Turner was assisted during the field season by Messrs. C. E. Knecht and J. D. Reed. The work of the summer consisted in the mapping of the Silver Peak quadrangle, in Esmeralda County, Nevada, which was completed in September. Many specimens of rock and ore and numerous fossils were collected. Several days were spent in the Inyo Mountains, collecting fossils, and a trip from Lone Pine to the summit of Mount Whitney was made, data being gathered throughout the trip for a geologic map of the southern Sierra Nevada on a 6-mile scale, for which Mr. J. N. LeConte compiled a drainage map to serve as basis.

During the winter and spring Mr. C. E. Knecht studied microscopically the volcanic rocks of the Silver Peak quadrangle. Mr. Turner's own work consisted in writing up notes on formations of the Silver Peak quadrangle and in a study with the microscope of the igneous and metamorphic rocks. Thin sections of the Yosemite rocks were also studied, in preparation for the revision of portions of the Yosemite quadrangle.

Collections of rocks made during reconnaissances in the Mount Lyell area were also studied, as an aid to field work in that quadrangle the present season.

During the year the following articles were prepared by Mr. Turner for publication:

The Esmeralda formation: Am. Geol., March, 1900.

The nomenclature of feldspathic granolites: Jour. Geol., February-March, 1900.

The Pleistocene geology of the south-central Sierra, with especial reference to the region of the Yosemite Valley: Proc. California Acad. Sci.

The Esmeralda formation, a fresh-water lake deposit, with a description of the fossil plants, by F. H. Knowlton, and of a fossil fish, by F. A. Lucas: Twenty-first Ann. Rept. U. S. Geol. Survey, Part II.

During about six weeks of office work Mr. Turner was assisted by Mr. George I. Adams.

Diller party (*Oregon*).—Mr. J. S. Diller continued his work in southern Oregon, assisted by Messrs. A. J. Collier and James Storrs. During the season the southern portion of the Port Orford quadrangle was surveyed, the work progressing slowly on account of the great variety of rocks and the complicated structure of the region. Special attention was given to the coal-bearing formation. In September a trip east across the range was made, where Mr. Diller was joined by Prof. Lester F. Ward and Mr. W. Q. Brown for the purpose of studying the supposed Jurassic slates of Thompson Creek and Cow Creek. Large collections of fossil plants were made. Before returning to Washington Mr. Diller spent a few days in reexamining the southeastern portion of the Coos Bay quadrangle.

In the office the Coos Bay map and folio text were revised and submitted for publication. A paper on The Coos Bay Coal Field by Mr. Diller appeared in the Nineteenth Annual Report, and one on The Bohemia Mining Region in the Twentieth Annual Report. During the year fifty-four collections of remnant specimens of the Educational Series of Rocks were distributed to educational institutions. Mr. Diller continued as chairman of the Petrographic Committee, and Messrs. F. C. Ohm, W. S. Robbins, and William Ohm were employed in the laboratory, of which Mr. Diller had special charge. Within the year nearly 5,000 thin sections were prepared, and large numbers of specimens were cut and polished for study.

On June 1, 1900, Mr. Diller resumed work in the Port Orford quadrangle, with the assistance of Messrs. James Storrs and Chester Washburne.

Smith party (*Washington*).—Mr. George Otis Smith, under the general direction of Mr. Bailey Willis and in cooperation with Mr. W. C. Mendenhall, completed the mapping of the Mount Stuart quadrangle, Kittitas County, Washington. This quadrangle, it is believed, furnishes the key to the geologic section of the northern Cascades, since most of the formations are here represented and their relations can be determined. The selection of this quadrangle for the inauguration of the work in the northern Cascades proves, therefore, to have been a wise one. In July, 1899, work was commenced on the Snoqualmie quadrangle, which lies west of the Mount Stuart quadrangle.

In the office the maps and sections for the Mount Stuart folio were prepared, and the manuscript of the text was nearly completed. In cooperation with Mr. Willis, a paper was prepared on the Clealum iron ores, which were examined in the course of mapping the Snoqualmie quadrangle, the paper being presented at the meeting of the American Institute of Mining Engineers. Two papers were written for the meeting of the Geological Society of America—one entitled Camas Land, a Valley Remnant, written in cooperation with Mr. George C. Curtis; the other entitled Tertiary Granite in the Northern Cascades, prepared by Mr. Smith and Mr. Mendenhall jointly. Mr. Smith served throughout the year as a member of the Committee on Petrographic Reference Collection.

Mr. Willis joined Messrs. Smith and Mendenhall in the Snoqualmie quadrangle and devoted the time from August 20 to September 20 to detailed observations on the stratigraphy and structure of the Eocene and later formations, and the physiography of the district.

In the latter part of May, 1900, Mr. Smith, assisted by Mr. F. C. Calkins, field assistant, commenced work on the Ellensburg quadrangle, special attention being given to the underground water resources.

Gilbert party (*Washington.*)—Mr. G. K. Gilbert spent June and July in Alaska as a member of the Harriman expedition.

This gave him a valuable opportunity to pursue his studies of existing glaciers, Pleistocene glaciation, and changes in the relations of land and sea. Returning to Seattle the last of July, he took up the study of the group of terraces in the Snake River Valley, tracing them through a portion of the valley of Columbia River. A study was also made of the submerged forest of the Columbia between the Dalles and the Cascades, and attention was given to the eolian sand features of the canyon of the Columbia.

During the office season the notes made during the summer were elaborated, and progress was made on a report on the glaciers and Pleistocene phenomena observed on the Harriman expedition.

GLACIATED REGION.

Chamberlin party (northern United States).—Prof. T. C. Chamberlin has been privately as well as officially engaged for a number of years in special studies designed to determine the criteria for mapping the complex and obscure formations due to the great ice sheets which formerly covered Canada and northern United States. He has had a number of trained assistants, and their observations and conclusions will be presented in several papers, some of which have already been offered for publication by the Survey, while others are in preparation.

During the year Mr. Frank Leverett was engaged in field work for the monograph on the surface features and glacial formations of the district between Lake Erie and Genesee, Allegheny, and Ohio rivers. In the Huron-Erie basin his attention was directed to the mapping of the series of beaches which lie on the western and southern borders of the Erie portion of the basin. In the valley of the Ohio and its northern tributaries attention was given to the effect of glaciation on the drainage. Three weeks were spent in work in the Danville (Illinois) quadrangle.

In the field Mr. William C. Alden resumed work in the quadrangles in the southeastern part of Wisconsin, gathering data for the preparation of three folios of the Geologic Atlas. He completed field work in the Racine and Muskego quadrangles and the mapping of the Silver Lake, Geneva, Eagle, and Whitewater quadrangles, as well as a part of the Koshkonong quadrangle.

In the office Mr. Leverett completed the manuscript of his monograph and prepared a report on the surface features and glacial formations of the Danville (Illinois) quadrangle, which is to be incorporated with Mr. Campbell's report on the coal deposits of the Danville quadrangle.

Mr. Alden devoted the office season to the preparation of the manuscript maps and illustrations of a special folio for the city of Milwaukee. Work was also begun on the folio which will describe the Muskego, Silver Lake, Eagle, and Geneva quadrangles.

During June, 1900, Mr. F. B. Taylor was engaged in rounding out the extensive observations made in previous years at his own expense in eastern Michigan, generously contributing his full results to the monograph now in preparation on the Michigan glacial tract.

During the year members of Professor Chamberlin's party have published the following articles under his supervision:

The glacial gravels of Maine, by George H. Stone: Monograph XXXIV.
The Illinois glacial lobe, by Frank Leverett: Monograph XXXVIII.
Moraines of southeastern South Dakota and their attendant deposits, by James E. Todd: Bull. No. 158.

ALASKA.

The geologists engaged in work in Alaska last year were Messrs. F. C. Schrader and A. H. Brooks. Mr. Schrader was in charge of the party that explored the Chandlar and Koyukuk rivers; Mr. Brooks was associated with Mr. Peters, topographer, in charge of the party which proceeded by the Dalton trail along the Upper Alsek, past Lake Kluane, and across White River to the Tanana Valley and thence to Eagle City. The routes and itinerary are given in connection with topography (pp. 145–149), and the geologic details in papers by Messrs. Schrader and Brooks in Part II of this Annual Report.

Mr. Oscar Rohn having, in connection with the military exploring party under Captain Abercrombie, made a reconnaissance of the Chitina Valley and the Wrangell Alps, prepared a report on the topography and geology of that region, which is also included in Part II of this Annual Report.

PHILIPPINE ISLANDS.

Becker party.—The earlier part of the last fiscal year was spent by Dr. George F. Becker in geologic examinations of the Philippine Islands, so far as the military situation permitted. He was able to examine some of the environs of Cebú, on the island of the same name, and to visit the coal deposits at Mount Uling (i. e., Coal Mountain), also on Cebú, one of the chief mineral regions of the archipelago. He also visited the town of Joló and its environs, coasted along the shore of Mindanao, though without landing, and was able to study the terracing of various islands from the deck of a steamer. In September, by the courtesy of General Lawton, he was permitted to cruise in a gunboat on Laguna de Bai, touching at various points along the shore to examine the formations, but although always accompanied by an escort of soldiers, it was not considered expedient to proceed more than a few hundred yards from the shore. General Otis declined to permit him to visit the provinces of Sorsogon and Albay, and finding no further expeditions practicable, he left Manila the middle of October, after making a brief report to the military governor on the geology of the islands, and proceeded to the Straits Settlements, Banka, where he made some studies of the tin deposits.

Dr. Becker reached Washington via England the middle of January, and has since been employed chiefly in compiling and discussing features of Philippine geology. In June, 1900, he was assigned to the charge of the Division of Chemical and Physical Research.

FIELD AND OFFICE WORK BY MR. WILLIS, ASSISTANT IN GEOLOGY TO THE DIRECTOR.

During the last fiscal year the work of Mr. Bailey Willis was largely administrative, embracing office routine and details of organization and questions relating to the character and the time and manner of publication of the scientific results in geology. Such studies as he was able to pursue were directed to the bearing of certain local phenomena upon the general problem of the development of mountain ranges. His general instructions in regard to field work called for conference with geologists in various parts of the United States. Accordingly he visited the Black Hills, where ten days were spent, partly with Mr. Darton, in the southern portion of the uplift, and partly with Dr. Jaggar, in the vicinity of Deadwood. Proceeding to the Cascade Range, Washington, he was occupied with field work in cooperation with Messrs. Smith and Mendenhall during one month. He then attended the National Irrigation Convention at Missoula, September 25 to 28, and remained in Missoula until the middle of October, engaged in local reconnaissance upon the pre-Cambrian and Paleozoic formations and in editorial work upon folio texts. He then proceeded via Tacoma and Portland to San Francisco, where he was engaged until November 2 in occasional conference with Professor Lawson and in study of the local geology, in order that he might familiarize himself with its problems and thus be able to give proper consideration to the folios which Professor Lawson is preparing for publication. The absence of Professor Branner in Brazil prevented a proposed joint conference of the geologists interested in local work. Between November 2 and 20, in company with Dr. H. L. Fairbanks, an exploration was made of the Santa Lucia Range. It was found that this, the most southwestern mountain range of the United States, is of relatively recent growth, but that it has been preceded at least twice since Paleozoic time by equal or greater mountain growths, alternating with epochs of submergence, upon the same site. This work was undertaken as an auxiliary study to Dr. Fairbanks's work in the vicinity of San Luis Obispo, and some assistance was extended to him in reading the physiographic record of that region. At Los Angeles a day was spent in considering the problem of the underground reservoir of the San Fernando Valley and the subterranean channel of the Los Angeles River. En route east, visits were made to Madison, Wisconsin, and to Chicago, for conference with Professors Van Hise and Chamberlin, respectively, and Washington was reached December 2.

From December to the close of the fiscal year Mr. Willis was continuously occupied with administrative, editorial, and scientific work. He served as a member of the Committee on Building for the Survey and of the Committee on the General Geologic Map of the United States, and as chairman of the committees on Chemical Analyses and Illustrations. In cooperation with Mr. Goode and in conference with Alaskan explorers, he prepared plans for Alaskan surveys, gathered and arranged the data for the report on insular surveys, and considered many minor questions affecting the administration and organization of the Geologic Branch.

FIELD AND OFFICE WORK BY THE DIRECTOR.

The general administrative work of the Survey occupied the greater part of the Director's time. In connection with his position in the National Museum, he visited New Brunswick and Newfoundland for the purpose of studying the Lower Paleozoic and pre-Paleozoic formations, so well developed in those provinces. Important geologic data and large collections of rocks and fossils were secured. As opportunity offered papers were prepared on the results of this field work and on the results of the work of the Geological Survey in relation to the mineral resources of the United States. The monographic study of the Cambrian Brachiopoda was also continued.

Under instructions from the Director, Mr. F. B. Weeks made extensive collections of Lower Paleozoic fossils from the vicinity of Silver Peak, Nevada. In July, 1899, he completed and transmitted for publication the manuscript of a Bibliography of North American Geology, etc., for the year 1898, which was published as Bulletin No. 162. On returning from the field, in October, he gave his attention to the compilation of a card catalogue of geologic formation names. With the assistance of several geologists for a short time this important work was completed in April. A Bibliography of North American Geology, etc., for the year 1899, was then taken up and completed. This will be published soon as Bulletin No. 172. Mr. Weeks is a member of the Committee on Geologic Formation Names. The work of this committee is greatly facilitated by his card catalogue, mentioned above.

In the office work of the year the Director was assisted by Miss Jean F. Kaighn, confidential clerk, and by many others in the Survey, as occasion required.

Division of Paleontology.

As usual, most of the paleontologists were engaged from time to time in assisting geologists to determine and correlate various formations. The work of the paleontologist frequently borders so closely on that of the geologist as to render treatment under a separate head scarcely possible.

Girty party (Carboniferous).—Dr. George H. Girty spent three months of the summer of 1899 in field work in northwestern Pennsylvania, measuring sections and collecting fossils in the "subconglomerate" formations of the Lower Carboniferous. Most of his attention was given to the geology of Crawford County, but work was also done in Erie, Warren, Venango, and Mercer counties. This investigation is in direct connection with that which has been carried on for several years by Dr. Girty in the Lower Carboniferous rocks of Ohio and Michigan.

In the office Dr. Girty nearly completed a paper on The Stratigraphic Paleontology of the Carboniferous Rocks of Colorado. He also examined and reported upon a number of collections of fossils from the middle and upper Paleozoic formations for various members of the Survey, in connection with their areal geologic work. Some time was given to collaboration on the card catalogue of formation names, mentioned on page 89, and to the selecting of material and the supervising of drawings for a monograph by the Director on Cambrian Brachiopoda.

Stanton party (Cretaceous).—Mr. Timothy W. Stanton was engaged in the office during the year. His principal work was the continuation of the preparation of a monograph on the Lower Cretaceous faunas of the Texas region, a study now approaching completion. This monographic work was subject to frequent and sometimes long interruptions on account of urgent routine duties. These included reports on collections sent in for examination by geologists and correspondents of the Survey and care of the study collections in the National Museum.

Under Mr. Stanton's supervision, Prof. F. W. Cragin, of Colorado College, nearly completed the revision of the Jurassic fauna which was first recognized by him near Malone, Texas.

Ward party (Cretaceous).—In August Prof. Lester F. Ward, accompanied by Prof. Wilbur C. Knight, State geologist of

Wyoming, began the study in the Freezeout Hills of a section of strata containing bones of dinosaurs and other Jurassic animals and a deposit of cycadean trunks, discovered by one of Professor Knight's assistants, Mr. W. H. Reed. A section was made, and the cycad beds were located at about the middle of the fresh-water Jurassic, in association with dinosaurian bones. Professor Ward next proceeded to Oregon, joining Prof. J. S. Diller at Riddles. A study of the sections and plant remains proved the existence of a considerable deposit of Jurassic rocks in the vicinity of Buck Mountain on Cow Creek, and in the vicinity of Nichols, near the eastern end of Table Mountain. Representative collections were made covering all the critical points.

Professor Ward next visited the locality known as the Petrified Forests of Arizona, for the purpose of obtaining such information as might be of value touching the proposition to set aside the region embracing the Petrified Forests as a national park. A thorough examination was made in the vicinity of the town of Williams, 35 miles west of Flagstaff, and in the vicinity of Holbrook, where the petrified forests are extensively developed. His exploration was also extended down the Little Colorado to the Lees Ferry road. On returning to Washington he prepared a report on the Petrified Forests, which was published by the Department of the Interior as a special document.

Professor Ward also visited New Haven, Connecticut, to study the large collections of cycads that had been added to the Yale collection. In addition to the various minor matters in the office, work on the Compendium of Paleobotany was advanced, Miss Schmidt making noteworthy progress on the bibliography. For the purpose of consulting the paleobotanical collections and libraries, Professor Ward, at his personal expense, visited the British Museum and the Jodrell laboratory at Kew, and late in June proceeded to Paris for like purpose.

Fontaine, W. M., work of.—Professor Fontaine examined and determined various collections of fossil plants from Oregon, and made preliminary reports on them. He made a trip to Williams College to study Emmons's collection of North Carolina fossil plants and described them for publication. He also reviewed and criticised Professor Wanner's collection of fossils from near York, Pennsylvania, and determined and described collections of fossil plants made by Professor Ward in the District of Columbia and in Maryland.

Knowlton party (*Cretaceous*).—Prof. F. H. Knowlton did not take the field during the year, as it was deemed advisable that he continue his memoir on the flora of the Puget formation. If the drawings can be completed, this will be submitted for publication before the close of the current fiscal year. Later he assisted in the preparation of the index to geologic formation names by indexing certain publications assigned to him. From December 1 to May 1 his entire time was occupied in studying and reporting on various collections of fossil plants for geologists of the Survey. These included reports on (1) Triassic wood from Virginia and North Carolina, for Professor Ward; (2) internal structure of cycads from Wyoming, for Professor Ward; (3) plants from indurated clay from brink of Grand Canyon of Yellowstone River, for Mr. Arnold Hague; (4) small collection of fossil plants from North Fork of Monastash Creek, Washington, for Mr. George Otis Smith; (5) collection of fossil plants made near Martin, Washington, for Mr. George Otis Smith; (6) fragmentary plants from Death Valley, California, for Mr. J. E. Spurr; (7) Miocene plants from Montana, for Mr. Earl Douglass; (8) coniferous plants from Newark system of Connecticut, for Prof. W. H. Hobbs; (9) fossil plants from the Durango quadrangle, Colorado, for Mr. A. C. Spencer; (10) plants from Alaska, collected by Mr. F. C. Schrader; (11) plants from Montana, for Mr. Earl Douglass; (12) fossil plants of the Esmeralda formation, to accompany a paper on the geology of this formation, by Mr. H. W. Turner (see this Annual Report, Part.II); (13) fossil wood from the Triassic of the Pomperaug Valley, Connecticut, to accompany a paper by Prof. W. H. Hobbs (see this Annual Report, Part III), and (14) Pleistocene plants from Columbia River, Oregon, for Mr. G. K. Gilbert. Professor Knowlton also read the proof of his bulletin on the Flora of the Montana Formation (Bulletin No. 163) and of an article in the Twentieth Annual Report, Part III, on the Fossil Plants Associated with the Lavas of the Cascade Range.

Dall party (*Tertiary*).—The field work of Dr. William H. Dall was undertaken in connection with the Harriman expedition to Alaska and the Bishop Memorial Museum, of Honolulu. All the expenses of the latter trip were borne by the museum or Dr. Dall, and every facility was provided him for studying the Tertiary elevated reefs on the Island of Oahu by the director of the museum and several residents of Honolulu. The results of these observations were summed up in an appendix to a report on the geology of Oahu by Prof. C. H. Hitchcock. Dr. Dall concludes that the Tertiary age of these reefs, as in the case of the other South Sea reefs studied by Prof. Alexander Agassiz during recent years, seems reasonably well assured, the Pleistocene reefs in all cases being very near sea level and easily differentiated by their condition.

In the office Dr. Dall was engaged in routine work, including the identification of various collections of fossils for members of the Survey, especially large series from Oregon for Mr. J. S. Diller. Notes of the summer's field work were also written up and prepared for publication.

Early in January Dr. Dall again took up the revision of the Tertiary fossils of Florida and the southeastern United States, and carried it through the Tellinacea and Leptonacea to the beginning of the Lucinacea.

Mr. T. Wayland Vaughan was engaged during the year chiefly in office work. Collections were identified and systematically arranged from the Jackson horizon at Jackson, Mississippi, and the Claiborne horizon at Jackson, Alabama. A collection from Vicksburg, Mississippi, was also arranged, and the identification of the collections from the Red Bluff horizon, Mississippi, was almost completed. Mr. Vaughan's principal work was in connection with monographing the post-Eocene corals of the United States. As nearly all the latest Tertiary corals also occur in the present seas, it was necessary to study the living fauna of the Gulf of Mexico and Caribbean region. In this connection studies were made of the collections in the National Museum, and a report was written for the United States Fish Commission on the corals collected by the Porto Rico expedition of 1898–99. A report was also written on Some Fossil Corals from Curaçao, Oruba, and Buen Ayre, for the Royal Dutch Geological Museum in Leyden. All of this material will be of service in the preparation of the monograph mentioned. Considerable work was also done on a general bibliography of corals, and a bibliography on the post-Eocene fossils and Recent corals of eastern North and South America and the West Indian and Caribbean regions was prepared for publication. Besides several minor publications on corals, Mr. Vaughan read the proof of a monograph on the Eocene and Lower Oligocene Corals of the United States (Monograph XXXIX) and of a paper entitled Reconnaissance in the Rio Grande Coal Fields of Texas (Bulletin 164). He also assisted in the preparation of the catalogue of geologic formation names, the literature of the Tertiary being assigned to him.

Mr. Frank Burns was sent by Dr. Dall to the Pliocene region near Peace Creek in southeastern Florida, where he obtained a large and valuable collection. In the office he was engaged in cleaning, sorting, and registering fossils.

The confusion existing in much of our knowledge of the southern Tertiary formations can be corrected only by the application of paleontologic tests, and for this reason Dr. Dall has been systematically accumulating for a number of years large series of fossils from each geologic horizon.

In the office Dr. Dall gave a great deal of time and attention to assisting geologists and correspondents of the Survey in the identification of fossils and in researches in the literature of the Tertiary formations.

Division of Chemistry.

The force at work in the Division of Chemistry during the fiscal year 1899–1900 was the same as for the preceding year, and consisted of Prof. F. W. Clarke (in charge), Dr. W. F. Hillebrand, Dr. H. N. Stokes, and Mr. George Steiger. Routine work of the usual character occupied most of the time, and in all 171 analyses were reported.

In the course of the year three bulletins were prepared, two of which are already printed. No. 167 contains the miscellaneous scientific researches which have been carried out in the laboratory during the last five years, and No. 168 is a compilation of rock analyses, over 1,400 in number, made by the chemists of the Survey since its earliest organization. The third bulletin (No. 176), by Dr. Hillebrand, is a treatise on the methods employed in the analysis of silicate rocks and embodies the experience gained in the laboratories of this Bureau. Bulletins 168 and 176 represent a revision and enlargement of Bulletin No. 148, which has been entirely distributed and for which there is still a steady demand. Dr. Hillebrand's portion of that bulletin has been reproduced as a separate volume in Germany, translated into German by Dr. E. Zschimmer.

The researches upon the constitution of the natural silicates, by Professor Clarke and Mr. Steiger, have been continued and have led to unusual results, for the investigators have found it possible, in many silicates, to replace the alkalies, and even lime, by ammonium. No silicates of ammonium have heretofore been known, and this substitution of a volatile base for fixed bases opens up an entirely new and very fruitful field in mineralogic research. The work will be continued from time to time as opportunities offer.

Early in 1899 attention was called to a remarkable discovery, in Colorado, of a new mineral containing vanadium and uranium. This mineral, carnotite, was found in commercial quantities, and offers a new source of the rare metals which it contains, and for which there is some economic demand. Dr. Hillebrand has made a very laborious investigation of this new material, and with it has studied a remarkable vanadiferous sandstone in which relatively large quantities of the rare vanadium mica, roscoelite, occurs; and his results, together with a report on the geology of the region by Mr. Ransome, will soon be published.

In addition to the regular work of the division, many demands are made upon it for the identification of minerals, ores, etc., sent from all parts of the United States. Between January 1 and June 30 more than 140 such samples were examined and reported on, an average of about one for each working day.

Division of Hydrography.

This division was continued in charge of Mr. Frederick H. Newell, whose assistants in the various subdivisions of investigations were Messrs. Arthur P. Davis, Charles H. Fitch, Willard D. Johnson, N. H. Darton, Cyrus C. Babb, H. A. Pressey, Edwin G. Paul, Gerard H. Matthes, and Charles R. Olberg. In addition there were employed in the field a number of assistants, designated as resident hydrographers, whose names are given below, in connection with the work in various localities.

Mr. Arthur P. Davis, shortly after the beginning of the fiscal year, severed his connection with the investigation of the practicability of storing water along Gila River for the purpose of irrigating the Gila River Indian Reservation. This was continued by Mr. J. B. Lippincott, and the results have been published in Water-Supply Paper No. 33. Mr. Davis obtained leave of absence for one year, in order to continue investigations in Central America for the Isthmian Canal Commission, similar to those which he had begun for the Nicaragua Canal Commission under the Department of State.

Mr. Charles H. Fitch, formerly in charge of the Indian Territory section of topography, was transferred to the Division of Hydrography in the latter part of the fiscal year, to take up reservoir surveys in the Rocky Mountain region.

Mr. Willard D. Johnson continued his studies of the Great Plains area and completed the paper on The Utilization of the Great Plains, published in Part IV of this Annual Report.

Mr. N. H. Darton continued systematic examination of the region in the vicinity of the Black Hills in Wyoming and South Dakota. The results of his work are shown in the paper in Part IV of this Annual Report. Work was also continued in South Dakota by Prof. James E. Todd, the results being given in Water-Supply Paper No. 34. Mr. C. M. Hall, of Fargo, North Dakota, carried on similar work in adjacent areas.

Mr. Cyrus C. Babb continued as an assistant on the survey of Gila River, and in October, 1899, began a survey and examination of the Uinta Indian Reservation, in northeastern Utah, for the purpose of ascertaining the water supply and practicability of irrigating the agricultural lands of this reservation.

Mr. H. A. Pressey gave most of his time to the preparation of data relating to New York streams. Measurements of these were begun by the United States Board of Engineers on Deep Waterways, and have been continued by this Survey. The field work was carried on mainly by Mr. Robert E. Horton. Late in the fiscal year Mr. Pressey took up work in the vicinity of the proposed Southern Appalachian Park, in order to ascertain the outflow from this important mountain area.

Mr. Edwin G. Paul continued in charge of the instrumental equipment and the rating of meters, and, in addition, carried on field work in Pennsylvania, Maryland, and West Virginia, mainly in the drainage basin of Delaware, Susquehanna, and Potomac rivers.

Mr. Gerard H. Matthes made a detailed survey of the Riverside reservoir site in Arizona, and in October carried on a reconnaissance in Mancos Canyon, in southeastern Colorado, to ascertain the cost and capacity of the small reservoir sites in or adjacent to that portion of the Southern Ute Reservation. Upon the completion of this work he returned to Washington to write his report and to prepare material for Part IV of the Annual Report.

In addition to the special investigations above mentioned systematic field work was carried on in a manner similar to that described in the Eighteenth, Nineteenth, and Twentieth annual reports, the allotment of funds being similar to that of preceding years. The results are shown in the accompanying volume on hydrography (Part IV) and in the series of Water-Supply and Irrigation Papers, 39 of which have now been published.

The following list gives, in general geographic order, the names of the States or groups of States where work was conducted, and also the names of the engineers or resident hydrographers under whose direct charge the operations were performed.

HUMID REGION.

New England.—The study of the hydrographic data for southern New England was continued by Prof. Dwight Porter.

New York.—Measurements of streams issuing from the Adirondacks and tributary mainly to Black, Mohawk, and Hudson rivers were continued by Mr. H. A. Pressey and Mr. Robert E. Horton. This work was done in cooperation with the office of the State engineer and surveyor, and appropriations were made by the legislature of New York for this purpose.

Pennsylvania.—Measurements of Delaware and Susquehanna rivers and their tributaries were carried on from the Washington office by Mr. Edwin G. Paul.

Maryland.—Prof. William B. Clark, State geologist, continued to render efficient assistance in the maintenance of river stations, principally on tributaries of the Potomac.

Virginia and West Virginia.—A number of streams were systematically measured in these States, the work being largely performed by Prof. D. C. Humphreys, of Lexington, Virginia.

North Carolina and South Carolina.—Prof. J. A. Holmes, State geologist, continued active cooperation, the field work, as in the past, being done by his assistant, Mr. E. W. Myers.

Georgia, Florida, Alabama, and Tennessee.—Prof. B. M. Hall, of Atlanta, Georgia, with the aid of his brothers, extended the river measurements in the region where water power is being developed, and in this work assistance was rendered by Prof. W. S. Yeates, State geologist of Georgia, and by Prof. Eugene A. Smith, State geologist of Alabama.

Ohio.—Measurements of a few rivers of this State were made through cooperation with Dr. C. O. Probst, secretary of the State Board of Health, the work being done by Mr. Benjamin H. Flynn. Prof. C. N. Brown, of the Ohio State University, also rendered assistance.

Mississippi Valley.—Facts relating to the flow of Mississippi River and its tributaries were brought together by Mr. William Starling, of Greenville, Mississippi.

SUBHUMID REGION.

South Dakota.—Mr. N. H. Darton, geologist, continued field work and the preparation of his report on the artesian conditions in the vicinity of the Black Hills. Mr. James E. Todd, of Vermilion, South Dakota, also extended the mapping of the underground waters, the results, as previously noted, being printed in Water-Supply Paper No. 34.

Nebraska.—Facts concerning the rivers of this State were obtained by Prof. O. V. P. Stout and his assistants, Messrs. Glenn E. Smith and Adna Dobson.

Kansas and Oklahoma.—All of the river stations in Kansas were maintained by Mr. W. G. Russell, and a number of river measurements were made in the adjacent Territory of Oklahoma.

Texas.—A number of streams in this State were systematically measured by Prof. Thomas U. Taylor, of Austin, who also brought together facts bearing upon the destruction of the Austin dam, which took place on April 8, 1900.

ARID REGION.

The greater part of the field work was carried on within the arid region, where the opportunities for development through water conservation are very great. A number of reservoirs were surveyed and estimates of their capacity and cost were prepared. Canal lines conducting the water from these reservoirs to the irrigable lands were also examined on the ground, and the cost of construction was ascertained.

Arizona.—The survey of reservoirs along Gila River was brought to a conclusion, and the results were printed in Water-Supply Paper No. 33. This work was begun by Mr. Arthur P. Davis and carried on by Mr. J. B. Lippincott, the estimates and conclusions being verified by Mr. James D. Schuyler, whose report has been printed as Senate Document No. 152, Fifty-first Congress, first session.

California.—The drought conditions have continued in this State and the necessity for water storage has become so apparent that concerted action has been found necessary on the part of various associations. The California Water and Forest Society in particular has raised a fund of several thousand dollars, a portion of which it is intended to use in cooperation with the United States Geological Survey for examination of reservoir sites and for the determination of available water supply. The field work has been under the supervision of Mr. J. B. Lippincott. The principal reservoir survey is the Hetch Hetchy, near the headwaters of Tuolumne River. Systematic measurements were begun on the headwaters of the San Joaquin, Kings, Salinas, and other streams.

Colorado.—Mr. A. L. Fellows continued work in this State and maintained the river stations established in previous years.

Idaho.—Mr. N. S. Dils, of Caldwell, Idaho, had charge of the operations in this State, and received assistance from the State engineer, Mr. D. W. Ross.

Montana.—Prof. Samuel Fortier, of the Agricultural College at Bozeman, Montana, had charge of the river measurements in that part of the State. Prof. Fred D. Smith, of the University of Montana, at Missoula, Montana, maintained a few river measurements at points readily accessible, and made a reconnaissance of Flathead Lake.

Nevada.—A thorough examination of Truckee River and of Lake Tahoe was made by Mr. L. H. Taylor, who also kept up systematic measurements along Humboldt River and other streams.

New Mexico.—Mr. Philip E. Harroun, of Albuquerque, continued measurements along the Rio Grande and surveyed a number of reservoir sites. The flow of the river was also ascertained at El Paso, by Mr. W. W. Follett, consulting engineer of the International (Water) Boundary.

Oregon.—Investigations in this State were carried on in connection with those of the State of Washington.

Utah.—Prof. George L. Swendsen, of Logan, Utah, made measurements of Bear and Logan rivers. Mr. Cyrus C. Babb began a detailed survey of the Uinta Indian Reservation, in the northeastern part of the State.

Washington.—Various rivers, mainly on the east side of the Cascade Range, were measured by Mr. Sydney Arnold, of North Yakima, and streams on the Olympic Peninsula were measured by Mr. W. J. Ware, of Port Angeles.

Wyoming.—Systematic work was maintained by Mr. A. J. Parshall, assistant State engineer.

RESULTS.

The data obtained by field work during the calendar year 1899 were prepared for publication in Water-Supply Papers Nos. 35–39, inclusive. These form essentially one report, but owing to the limitations imposed by law (100 pages for each paper) it was necessary arbitrarily to divide the material into five portions. This report gives a description of each river, and of the points at which measurements are made; also the results of these measurements, the daily gage heights as reported by the observers, and other facts of interest to engineers and students. These data are printed in this form in order to make them available to the public as soon as possible. The estimated flow by months and for the year, and diagrams, maps, and other illustrations, were prepared for publication as Part IV of this Annual Report. This dual form has been found necessary in order to economize time and space. Water-Supply Papers can be issued at once, while the annual reports, with illustrations, can not be issued until about a year later.

Besides the Water-Supply Papers mentioned on page 75 of the Twentieth Annual Report, Part I, there have been printed: No. 31, on Lower Michigan Mineral Waters, by Dr. Alfred C. Lane; No. 32, on the Water Resources of Porto Rico, by Herbert M. Wilson; No. 33, on Storage of Water on Gila River, Arizona, by J. B. Lippincott; No. 34, on Geology and Water Resources of a Portion of Southeastern South Dakota, by J. E. Todd, and Nos. 35–39, inclusive, which, as before stated, give the results of stream measurements (Operations at River Stations) for the year 1899.

Division of Mineral Resources.

The Division of Mineral Resources continued under the direction of Dr. David T. Day. The first six months of the fiscal year were employed in the completion of the report, Mineral Resources, 1898. Before this had been completed, preparatory work for the collection of the statistics of the mineral production for 1899 was well advanced. This preliminary work consisted principally of the revision of the list of producers and the carrying on of the necessary correspondence in relation thereto. The statistics of mineral production being taken for the calendar year, the work of this division is distributed over the latter half of one and the first half of the next fiscal year. At the present time the report on the mineral production for 1899 is well advanced, the report on precious stones having been published in April, 1900. The reports on the production of coal, asbestos and graphite, sulphur and pyrite, mineral paints and barytes, soapstone, gypsum, phosphate rock, abrasive materials, iron ores, manganese ores, and iron and steel are already in the hands of the printer, and the manuscripts of the other chapters of the report are nearing completion.

Owing to the peculiar conditions which existed during 1899, principally the wonderful industrial activity that year, many new mines were opened and new metallurgic establishments started, which increased the difficulties of obtaining the reports promptly and has somewhat delayed their completion. Much of the work of the division, in addition to the statistical compilation, was given to the study of certain economic minerals where a demand had arisen for complete information. For this purpose Mr. George H. Eldridge was sent to study the asphaltum deposits of the United States, Dr. Hayes to study the deposits of bauxite in Arkansas, and similar investigations have been made in regard to other substances.

The force employed in the preparation of the volume of Mineral Resources, in addition to the various special agents, experts, and geologists detailed on special work, consisted of Dr. David T. Day, chief of division, assisted by Mr. Edward W. Parker and Mr. Jefferson Middleton, statisticians; Miss Helen Hough, Miss Katrine W. Cottrell, Mrs. L. L. Kimball, and Mrs. M. M. Raborg, clerks; Miss E. E. Crowell, stenographer; Mr. George T. Sabourin, copyist; Mr. Theodore H. Johnson, Miss Belle Worth Bagley, Miss Altha T. Coons, Miss Julia M. Corse, and Miss Agnes Gerry, statistical experts.

The work of the division is sufficiently advanced to be able to give the usual summary of the mineral products for the calendar year 1899. The record for that year was one far surpassing all precedents in regard to mineral production. The total value of the mineral product of the United States in 1899 is found to have approached one billion dollars, an increase of more than 40 per cent over the value of the products in the preceding year, and nearly double that of the output in 1889. Much of this increase was due to the extraordinary prices which ruled for pig iron during the greater part of the year, the value for this product being more than double that for 1898, and also more than double the combined value of the gold and the commercial value of the silver produced in the United States in 1899. The gains were distributed through nearly every branch of the mining industry, as will be noted in the following paragraphs.

METALS.

Iron and steel.—The pig-iron industry was in an extraordinarily prosperous condition in 1899, as shown by the enormous production of that year, the product being 13,620,703 long tons, valued at $245,172,654, as compared with 11,773,934 long tons, valued at $116,557,000, in 1898. The increase in production in 1899 over that of 1898 was therefore 1,846,769 long tons, or 15.69 per cent, while the value of the product increased from $116,557,000 in 1898 to $245,172,654 in 1899, a gain of $128,615,654, or 110.35 per cent. In this year it reached its maximum in both product and value, the latter being $93,972,244, or 62.15 per cent greater than the value of the product in 1890, which was the maximum value of this product until 1899. The average value per long ton of pig iron increased from $9.90 in 1898 to $18 in 1899. This was the highest price reached since 1884, with the exception of 1887, when it was $19, the average prices per long ton in recent years being as follows: 1897, $9.85; 1896, $10.47; 1895, $11.14; 1894, $9.76; 1893, $11.90.

Iron ores.—The production of iron ores in the United States during 1899 amounted to 24,683,173 long tons, an increase of 5,249,457 long tons, or 27 per cent, over the production of 1898 This was accompanied by an increase in value from $22,788,069, to $34,999,077, a gain of $12,211,008, or 53.59 per cent.

Copper.—The industry was marked by an increase from 526,512,987 pounds, valued at $61,865,276 to 585,342,124 pounds, valued at $104,190,898, a gain of 58,829,137 pounds and $42,325,622. The product in 1899, as in the preceding year, was the largest obtained up to that time, both in amount and in value. Extraordinary prices prevailed in 1899, considering the large production, the average price per pound for the year being 17.8 cents, as against 11.75 cents in 1898 and 11 cents in 1897.

Lead.—This is the only important product which showed a decline in 1899. It decreased from 222,000 short tons in 1898 to 209,240 short tons in 1899. The value increased from $16,650,000, to $18,831,600.

Zinc.—The amount of zinc produced in the United States in 1899 was 134,603 short tons, valued at $15,479,345, against 115,399 short tons, valued at $10,385,910, in 1898.

Gold.—The product of gold continued to increase, rising from 3,118,398 fine ounces in 1898, valued at $64,463,000, to 3,437,210 ounces, valued at $71,053,400 in 1899. In 1897 the value of the gold product was $57,363,000.

Silver.—The coining value of the silver product in 1899 was $70,806,626, as compared with $70,384,485 in 1898. The commercial value of the product in 1899 was $32,858,700, while in 1898 its commercial value was $32,118,420. This is an increase of $422,141 in the coining value and $740,284 in the commercial value.

The product in 1899 was 54,764,500 fine ounces, while in 1898 it was 54,438,000 ounces. The average value per ounce commercially in 1899 was 60 cents, and in 1898 it was 59 cents.

Quicksilver.—This product showed a decline in production of 638 flasks, while the value of the product increased $264,118, being a decrease of 2.05 per cent in production and an increase of 22.22 per cent in value. The product in 1899 was 30,454 flasks, valued at $1,452,745, as compared with 31,092 flasks in 1898, valued at $1,188,627. Texas for the first time enters the field as a producer of quicksilver in commercial quantities.

Aluminum.—The production and value of aluminum was the same in 1899 as in 1898, viz: 5,200,000 pounds, valued at $1,716,000.

Antimony.—The amount of antimony produced from domestic ores in 1899 was 237 tons. This includes the antimony contents of antimonial lead.

Manganese ore.—The production of manganese ore in 1899 fell off considerably, or from 15,957 long tons in 1898, valued at $129,185, to 9,935 tons in 1899, valued at $82,278—a decline of 37.74 per cent in product and 36.31 per cent in value.

Nickel.—The production of nickel increased quite markedly, from 13,411 pounds in 1898, valued at $4,694, to 22,541 pounds in 1899, worth $8,566, which is an increase of nearly 100 per cent in both product and value, nearly reaching the output of 23,707 pounds in 1897, which was the largest product since 1893, when it was 49,399 pounds.

Platinum.—The production of crude platinum continues to be small, though it has constantly increased since 1893. In 1899 the product was 300 ounces, valued at $1,800, while in 1898 it was 225 ounces, valued at $1,913. In 1898 the average value of the product was $8.50 per ounce, while in 1899 it was $6 per ounce.

FUELS.

Coal.—The total product of anthracite coal in Pennsylvania in 1899 was 53,944,647 long tons, equivalent to 60,418,005 short tons, valued at the mines at $88,142,130.

The total product of bituminous coal in 1899 (including lignite or brown coal, cannel, splint, and block coals, and the small anthracite product of Colorado and New Mexico) was 172,608,917 long tons, or 193,321,987 short tons, valued at the mines at $167,935,304.

The aggregate product of anthracite and bituminous coal in 1899 was 226,553,564 long tons, or 253,739,992 short tons, valued at $256,077,434.

The record made in 1899 is an important one. Not only did the production exceed all previous records, but it placed the United States at the head of the coal-producing countries of the world. The production in each of the last three years has been the largest up to that time. In 1897 the output reached, for the first time, a total of 200,000,000 short tons. The product in 1898 was 219,974,667 short tons, an increase of nearly 10 per cent over 1897. The statistics for 1899 show an increase of 33,765,325 short tons, or 15.35 per cent, over 1898, and of 53,518,327 short tons, or 26.73 per cent, over 1897. Comparing the product in 1899 with some of the earlier years of our history, a still more remarkable advance is shown. In 1889 our total production of coal was 141,229,613 short tons, showing an increase in ten years of 112,510,379 short tons, or nearly 80 per cent. In 1879 our production amounted to only 66,452,960 short tons, compared with which the output in 1899 shows an increase of about 280 per cent, while in thirty years the production has increased about 700 per cent, the yield in 1899 being eight times that of 1869, less than one generation ago. In the same period the production of Great Britain has about doubled, that of Germany has been multiplied by 4, and that of France by 2.5. In 1869 the coal product of Great Britain was nearly four times that of the United States, and that of Germany exceeded ours by about 20 per cent.

One of the interesting features of the history of coal production in the United States in the last three years is that the operators were prepared by the preceding years of depression to meet the demands made upon them by the period of prosperity through which the country has been passing. During the four or five years of "hard times" coal operators were contending with steadily declining prices, brought about by a continued overproduction and a keen competition for a market for the output. To meet these conditions methods were adopted wherever possible for cheapening the cost of production by the installation of coal-cutting machines, mechanical haulage, etc., so that when the extraordinary demands of the last two years developed many operators were able to expand their production 25 or 50 per cent without materially increasing the length of their pay rolls.

Another feature worthy of note, which is shown in the statistics for 1899, is the advance in the average price per ton and a consequent increase in the value of the product proportionately greater than the increase in product. As shown in the subsequent table, this is the first time in a period of twelve years when there has been an advance in the general average price. The improvement in the price of coal, however, is not so marked as that shown in many other commodities. Much of the coal marketed in 1899 was sold on contract made the preceding year, as it was not until the latter part of the year that the operators began to reap actual benefit from the improved condition.

The statistics regarding the use of mining machines show that the amount of bituminous coal undercut by machines in 1899 was 43,963,933 short tons, against 32,413,144 short tons in 1898, 22,649,220 tons in 1897, and 16,420,252 tons in 1896.

The total number of men employed in all the coal mines of the United States in 1899 was 410,635, working an average of 214 days, as compared with 401,221 men working 190 days in 1898, and 397,701 working 179 days in 1897.

In considering the coal product, these reports include not only the coal marketed, either by shipments to distant points or sold locally, but also that consumed by the mine employees and by the mine operators themselves in locomotives, under stationary boilers, etc., in working the mine, and technically known as colliery consumption. There are occasional exceptions, where operators use only slack or waste, which would otherwise be thrown on the dump and not get recorded, the miner not even being paid for it. These exceptions are few and the amount is so comparatively small as not materially to affect the total. Coal consumed in the manufacture of coke is also included in this report.

The coal shipped, sold to local trade and employees, and used in the manufacture of coke is considered the marketable product. The colliery consumption averages about 8 per cent of the total product in anthracite production and about 1½ per cent in bituminous mining. The marketable product in 1899 amounted to 244,612,654 short tons, as compared with 212,053,378 short tons in 1898.

Coke.—The statistics relating to the production of coke are not available at the time of the preparation of this statement. Mr. E. W. Parker, who prepares this report for the Survey, has been appointed special agent to prepare the report on the production of coke for the Twelfth Census, and on account of the detailed information asked on the schedules of that office some delay in completing the report has been unavoidable.

Petroleum.—The production rallied from 55,364,233 barrels in 1898 to 57,070,850 barrels in 1899, a gain of 1,706,617 barrels, or 3.08 per cent, although it did not reach the output of 1897, which was 60,475,516 barrels, its maximum output. The value increased from $44,193,359 in 1898 to $64,603,904 in 1899, a gain of $20,410,545, or 46.18 per cent. The average value per barrel for the whole United States in 1898 was 79¾ cents; in 1899 it was $1.13¼.

Natural gas.—The value of the natural-gas product increased to $20,024,873 from $15,296,813 in 1898. The amount of natural gas used shows a decrease, on account of the gradual exhaustion of the supply, but, owing to the high prices obtained for it, the value shows a noteworthy increase.

STRUCTURAL MATERIALS.

Stone.—The value of stone of all kinds increased from $38,441,354 in 1898 to $44,736,576 in 1899, a gain of $6,295,222, or 16 per cent. All of the varieties of stone participated in this increase, limestone and granite, however, making the greatest gain—nearly one-half of the whole.

The large export of slate, which for several years has been one of the astonishing features of the industry, continued, though the increase in 1899 over 1898 was only $6,458, while the increase in 1898 over 1897 was $589,963. The total value of the exports in 1899 was $1,363,617.

Clays.—The great activity in all branches of the clay-working industries in 1899 was one of the results of the general prosperity which the country enjoyed during that year. The value of the raw clay entering into the manufactured product is estimated to have been $12,500,000, being divided as follows: Brick, tile, and terra-cotta clays, $11,250,000; clays for pottery, paper manufacture, etc., $1,250,000.

Cement.—The Portland-cement industry in 1899 showed great gains over 1898, the product increasing from 3,692,284 barrels in 1898 to 6,232,719 barrels in 1899, a gain of 2,540,435 barrels, or 68.80 per cent. The number of establishments reporting showed a large increase, from 31 in 1898 to 41 in 1899. This industry was in a very prosperous condition and is rapidly gaining in importance.

The natural-rock cement showed a slight decline, from 8,418,924 barrels in 1898 to 8,311,688 barrels in 1899, a decrease of 107,236 barrels, or a little over 1 per cent.

The total production of cement was 14,544,407 barrels, valued at $15,291,621, as compared with 12,111,208 barrels in 1898, valued at $9,859,501. The most of this increase, as shown above, was in the Portland-cement industry.

ABRASIVE MATERIALS.

Millstones.—The value of the product increased from $25,934 in 1898 to $28,115 in 1899. The value of the product in 1899 was the largest in ten years.

Corundum and emery.—The combined product of this class of abrasives increased from 4,064 short tons in 1898 to 4,900 in 1899, but owing to the falling off in the production of the higher-priced corundum from North Carolina the value of the product was considerably less in 1899 than in the preceding year, the amounts being $275,064 in 1898 and $150,600 in 1899.

Garnet.—The amount of the product decreased slightly, from 2,967 short tons in 1898 to 2,765 tons in 1899. In this case the conditions were reversed, and the value increased from $86,850 to $98,325.

Grindstones.—The value of the grindstones produced in the United States in 1899 was, with one exception, the largest on record, amounting to $675,586, and was $185,817, or 38 per cent, larger than the value of the product in 1898. The largest production of grindstones reported in the history of the United States was in 1882, and was estimated at $700,000.

Infusorial earth.—The product increased from 2,733 tons, valued at $16,691, in 1898, to 4,634 tons, valued at $39,032.

Oilstones.—The value of oilstones and whetstones made in the United States in 1899 was the maximum in our history, amounting to $208,283, which, compared with 1898, when the value was $180,738, indicates an increase of $27,545, or 15 per cent.

CHEMICAL MATERIALS.

Phosphate rock.—The phosphate-rock industry in 1899 is marked by considerable increase in production in Florida and Tennessee, decreased production in South Carolina, and the beginning of a phosphate-mining industry in Pennsylvania. In Florida the increase in production was entirely in hard rock and in river pebble. No production of what is known as soft rock was reported in 1898 or 1899, and the amount of land pebble mined in 1899 was less than in the preceding year.

The decrease in South Carolina production was in the output of land rock, which was only 75,000 less than in 1898; this was only partly made up by an increase of 30,000 tons in the production of river rock. Tennessee production increased about 37½ per cent. Pennsylvania entered the phosphate-mining industry with an output of 2,000 tons. The total amount of phosphate rock reported from all sources in 1899 was 1,515,702 long tons, valued at $5,084,076, as compared with 1,308,885 long tons in 1898, valued at $3,453,460, indicating a total gain in product of 206,817 long tons, valued at $1,620,616.

Gypsum.—This industry showed remarkable activity during 1899, the output for the year being 47 per cent larger than that of 1898, which was the previous year of maximum production; the value did not increase in quite the same proportion as that of the product, the gain being 37 per cent. The total product in 1899 was 428,661 short tons, against 291,638 short tons in 1898 and 288,982 short tons in 1897. The value of the output taken in its marketable condition was $1,036,860 in 1899, as against $755,280 in 1898 and $755,864 in 1897. In arriving at the value of the gypsum, that portion of the product which is sold crude is taken at its value in the crude state, while the value of that which is made into calcined plaster is taken for the calcined plaster produced.

Bromine.—The product decreased in 1899 from that of 1898 by 53,975 pounds, making the total 433,004 pounds, valued at $108,251, as compared with 486,979 pounds in 1898, worth $126,614.

Borax.—While the product of borax increased over one and one-half times, or from 16,000,000 pounds in 1898 to 40,714,000 pounds in 1899, the value of the product increased only $19,882, or 1.77 per cent. The value of the product in 1898 was $1,120,000, while in 1899 it was $1,139,882.

Fluorspar.—The principal producing region for this material is Rosiclare, Illinois, and Marion and Crittenden counties, Kentucky. The product increased more than 100 per cent over that of 1898. The total production in 1899 was 15,900 short tons, against 7,675 short tons in 1898. The value increased from $63,050 to $96,650.

Sulphur.—The mines of Louisiana, which were idle in 1897 and 1898, resumed operations in 1899; and some sulphur was also produced in Nevada and Utah. The total product amounted to 4,830 short tons, valued at $107,500, against 1,200 short tons, valued at $32,960, in 1898.

Pyrite.—The product decreased somewhat, from 193,364 long tons in 1898 to 174,734 long tons in 1899. The value declined about $50,000, it being $593,801 in 1898 and $543,249 in 1899.

PIGMENTS.

Metallic paint.—Exclusive of mortar color, the amount of iron ore ground for pigment in 1899 was 23,423 short tons, a gain of 2,451 short tons over 1898, when the product amounted to 20,972 short tons. The value of the product decreased $14,034, it being $263,979 in 1898 and $249,945 in 1899.

Ocher, umber, and sienna.—The production of sienna in 1899 amounted to 14,124 short tons, valued at $140,168, as against 11,963 short tons, valued at $123,832, in 1898. The production of umber decreased from 537 short tons in 1898 to 473 short tons in 1899, and the production of sienna decreased from 689 short tons to 588 short tons, with proportionate decrease in value.

Venetian red.—The production of this pigment increased from 10,271 short tons, valued at $160,711, in 1898 to 11,991 short tons, valued at $210,361, in 1899.

Barytes.—The production of barytes, or heavy spar, used as a substitute for or adulterant in white lead, was the largest in our history and amounted to 41,894 short tons, valued at $139,528, against 31,306 short tons, valued at $108,339, in 1898. The year of previous largest production was 1892, when the amount was 32,108 short tons.

Zinc white.—The consumption of zinc oxide as a basis for white and colored pigments continues to increase, the amount of this material produced in 1899 being 40,146 short tons, valued at $3,211,680, against 33,000 tons in 1898, valued at $2,310,000.

Cobalt oxide.—The production increased from 7,848 pounds in 1898, worth $11,772, to 10,230 pounds in 1899, worth

$18,512, which exceeds the product of 1896 but does not equal that of 1897, when it reached its maximum of 19,520 pounds, valued at $31,232.

MISCELLANEOUS.

Bauxite.—The production of this ore of aluminum continues to increase, rising from 25,149 long tons in 1898 to 30,528 long tons in 1899. The value of the product increased from $75,437 in 1898 to $93,583 in 1899.

Fuller's earth.—This product showed a decline in 1899 from 1898, the amounts being 14,860 short tons in the earlier year, valued at $106,500, and 12,381 short tons in the later year, valued at $79,644.

Limestone for iron flux.—This product naturally kept pace with the increased production of pig iron, and 6,707,435 long tons were used in 1899 for this purpose, valued at $4,695,205; in 1898 the product was 5,275,819 long tons, valued at $2,638,000. This was an increase of 1,431,616 tons, or 27.13 per cent, while the value increased $2,057,205, or 77.98 per cent.

Magnesite.—This product was practically the same in 1898 and 1899, or 1,263 short tons in the former and 1,280 short tons in the latter year. The value of the product showed a greater difference, or $19,075 in 1898 and $18,480 in 1899. This product comes entirely from California.

Mineral waters.—This industry showed an increase from 28,853,464 gallons sold in 1898 to 39,562,136 gallons in 1899, a gain of 10,708,672 gallons, or 37.11 per cent, while the value decreased from $8,051,833 in 1898 to $6,948,030 in 1899, a loss of $1,107,803, or 13.76 per cent. In 1898 the average value per gallon was 27.9 cents; in 1899 it was 17.56 cents. This reduction in value is due to the fact that a number of new springs have reported with a large production at a low rate—about one-half a cent a gallon.

Monazite.—This product increased from 250,776 pounds in 1898, valued at $13,542, to 350,000 pounds in 1899, valued at $20,000.

Precious stones.—The value of the product increased from $160,920 in 1898 to $185,770 in 1899. Among the principal features of interest in the industry in 1899 may be mentioned an increase in the output of the sapphire mines of Fergus County, Montana, and the discovery of remarkably brilliant sapphires in Granite County, Montana, the continued output of turquoise in New Mexico, the development of turquoise localities in Nevada and California, a great increase in the amount of diamond cutting in the United States, and a continued search for minor gems in North Carolina, Maine, Connecticut, and other States.

Marls.—It is estimated that the production of marl in New Jersey for fertilizing purposes in 1899 was about the same as that in 1898, viz, 60,000 tons, valued at $30,000.

TOPOGRAPHIC BRANCH.

The general organization of the Topographic Branch remained practically the same as in preceding years. For purposes of administration there were four sections—the Atlantic section, Mr. H. M. Wilson, geographer in charge; the Central section, Mr. John H. Renshawe, geographer in charge; the Rocky Mountain section, Mr. E. M. Douglas, geographer in charge, and the Pacific section, Mr. Richard U. Goode, geographer in charge. On February 23 Mr. Goode was appointed chairman of the Topographic Committee, the other members being Messrs. Wilson, Renshawe, and Douglas.

An additional duty was laid upon the Topographic Branch in consequence of legislation placing under the supervision of the Director of the Geological Survey the location and marking of the ninety-eighth meridian between Canadian and Red rivers. Also, by direction of the Secretary of the Interior, an examination of the boundary lines of the Yakima Indian Reservation was made and maps and reports were submitted.

The topographic corps was increased by certification of the Civil Service Commission to the extent of one topographer, Mr. D. L. Reaburn, and six assistant topographers—Messrs. W. N. Brown, W. W. Gilbert, Thomas G. Basinger, David H.

Baldwin, George H. Guerdrum, and Rufus H. Sargent; and three other assistant topographers were added by transfer—Messrs. Oscar Jones, W. R. Harper, and A. F. Hassan.

Cooperative agreements were arranged with five States, $19,500 being allotted by the State engineer and surveyor of New York, $17,000 by the survey commission of Pennsylvania, $5,000 by the State geologist of Maryland, $2,500 by the topographic survey commission of Maine, and $1,000 by the State geologist of Alabama. The above amounts were all from appropriations made by the legislatures of the States mentioned for cooperation with the Geological Survey.

In connection with the topographic surveys, the surveys of the forest reserves, and the survey of the Idaho-Montana boundary line the following results were obtained:

Two base lines were measured; primary azimuth observations were made at 4 triangulation stations; 17 meridian lines were established; 232 triangulation stations were occupied; 923 miles of primary traverse were run; 36,737 square miles were covered by detailed topographic mapping, this area being distributed through 29 States and Territories; 12,108 miles of levels were run and 1,683 permanent bench marks were established, these bench marks being iron posts, bronze or aluminum tablets, or copper or aluminum plugs; and in connection with the Alaska surveys about 1,600 miles of reconnaissance traverse were run. With reference to the land surveys, 217 miles of the boundary of the Black Hills Forest Reserve were surveyed and marked, 92 miles of the ninety-eighth meridian between Red and Canadian rivers were surveyed and marked, and 71 miles of the boundary line between Idaho and Montana were marked.

The distribution of the control, topographic, and leveling work in the various States and Territories is shown on Pls. I and II, in pocket. The following tables give the details relating to topography and spirit leveling for the fiscal year:

Topographic surveys of the United States Geological Survey in 1899–1900, including levels run and permanent bench marks established.

State or Territory.	Contour interval.	Scale of publication.		Total area surveyed.	Levels.	
		1:62500.	1:125000.		Distance run.	Number of bench marks.
	Feet.	*Sq. miles.*	*Sq. miles.*	*Sq. miles.*	*Miles.*	
Alabama	50	....	482	482	84	11
Arizona	50	25	915	940	559	141
Arkansas	50	....	1, 996	1, 996	524	62
California	50–100	388	3, 148	3, 536	760	184
Colorado	20–100	90	794	884	187	57
Georgia	50	....	515	515	90	11
Idaho	100	....	1, 118	*a*1, 153	192	27
Illinois	10	630	....	630	....	....
Indiana	20	467	....	467	138	16
Iowa	20	....	1, 190	1, 190	314	24
Maine	20	426	....	426	307	12
Maryland	20	1, 216	....	1, 216	480	24
Minnesota	20	604	....	*b*632	315	17
Missouri	50	....	938	938	291	24
Montana	50	....	....	*c*90	170	34
Nebraska	50	....	1, 577	1, 577	248	97
New York	20	3, 308	....	3, 308	2, 359	164
North Carolina	100	....	1, 198	1, 198	182	20
Ohio	20	962	....	962	480	42
Oregon	100	....	433	433	378	57
Pennsylvania	20	1, 309	....	1, 309	1, 019	142
South Dakota	100	....	690	690	205	56
Tennessee	50	....	750	750	526	68
Texas	25	....	1, 125	1, 125	287	55
Utah	50	....	760	*d*784	192	39
Washington	100	....	2, 013	2, 013	389	64
West Virginia	20–100	201	400	601	190	43
Wisconsin	20	1, 369	1, 368	2, 737	604	46
Wyoming	50	....	4, 155	4, 155	638	146
Total	....	10, 995	25, 565	36, 737	12, 108	1, 683

a = 35 miles on scale of 1:63360.
b = 28 miles on scale of 1:15840.
c = 35 miles on scale of 1:63360 and 55 miles on scale of 1:31250.
d = 24 miles on scale of 1:20000.

Present condition of topographic surveys and the new areas surveyed in 1899–1900.

[Areas which were resurveyed are not included in this table.]

State or Territory.	Total area.	Area surveyed in 1899–1900.	Area surveyed to April 30, 1900.	
	Sq. miles.	*Sq. miles.*	*Sq. miles.*	*Per cent.*
Alabama	52,250	482	15,545	30
Arizona	113,020	940	57,730	51
Arkansas	53,850	1,996	16,500	31
California	158,360	3,394	53,002	33
Colorado	103,925	884	34,015	32
Connecticut	4,990		4,990	100
Delaware	2,050		644	31
District of Columbia	70		70	100
Florida	58,680		1,821	3
Georgia	59,475	515	14,522	24
Idaho	84,800	1,153	13,744	17
Illinois	56,650		4,485	8
Indian Territory	31,400		30,885	99
Indiana	36,350	467	610	2
Iowa	56,025	1,190	7,885	14
Kansas	82,080		62,746	76
Kentucky	40,400		10,433	26
Louisiana	48,720		7,492	15
Maine	33,040	426	4,236	13
Maryland	12,210	416	8,866	73
Massachusetts	8,315		8,315	100
Michigan	58,915		1,964	3
Minnesota	83,365	632	3,254	3
Mississippi	46,810		29	
Missouri	69,415	938	29,807	43
Montana	146,080	35	36,188	25
Nebraska	77,510	1,128	26,228	35
Nevada	110,700		28,949	26
New Hampshire	9,305		2,396	26
New Jersey	7,815		7,815	100
New Mexico	122,580		27,777	23
New York	49,170	3,308	21,700	44
North Carolina	52,250		12,252	23
North Dakota	70,795		6,327	9
Ohio	41,060	962	1,824	4
Oklahoma	39,030		4,146	11
Oregon	96,030	433	14,138	15

Present condition of topographic surveys and the new areas surveyed in 1899–1900—Continued.

State or Territory.	Total area.	Area surveyed in 1899–1900.	Area surveyed to April 30, 1900.	
	Sq. miles.	*Sq. miles.*	*Sq. miles.*	*Per cent.*
Pennsylvania	45, 215	1, 309	7, 947	18
Rhode Island	1, 250	....	1, 250	100
South Carolina	30, 570	....	3, 900	13
South Dakota	77, 650	....	16, 273	21
Tennessee	42, 050	750	18, 391	44
Texas	265, 780	....	58, 427	22
Utah	84, 970	760	63, 627	75
Vermont	9, 565	....	2, 844	30
Virginia	42, 450	....	29, 227	69
Washington	69, 180	2, 013	8, 471	12
West Virginia	24, 780	201	17, 227	70
Wisconsin	56, 040	1, 801	8, 078	14
Wyoming	97, 890	3, 295	16, 324	17
Total	3, 024, 880	29, 428	835, 316	28

Division of Triangulation.

ATLANTIC SECTION.

Primary triangulation was in progress at various times during the summer by eight different parties, and primary traverse for a short season by one party. This work was distributed over portions of seven States—Maine, New York, Pennsylvania, Maryland, West Virginia, Alabama, and Georgia. The total area covered by this primary control was 13,600 square miles, of which 750 square miles were controlled by primary traverse. The result of this control was to make available 54 additional quadrangles in which to prosecute future topographic surveys. In the progress of this work 141 triangulation stations were marked, and their geodetic positions were determined. One base line was measured in Pennsylvania, and numerous meridian marks were established at county seats within the area of survey.

New York.—Mr. W. T. Griswold, topographer, was in charge of a party extending triangulation in various portions of this

State during the months of July, September, October, and November. He established and marked the positions of four stations north of Saratoga and ten between Rochester and Hornellsville. These furnish control for 1,550 square miles, included within the limits of about nine 15-minute quadrangles.

Pennsylvania.—For administrative purposes Mr. S. S. Gannett, topographer, was designated for general supervision of triangulation in the State of Pennsylvania. There were at work in this State between the months of May and November seven parties, under the charge, respectively, of Messrs. S. S. Gannett, topographer; A. H. Thompson, geographer; Sledge Tatum, topographer; Oscar Jones and Walter R. Harper, assistant topographers, and E. L. McNair and D. H. Baldwin, field assistants. During the months of September and October Mr. W. Carvel Hall, topographer, was in charge of a party running primary traverse over four lines of railway between Baltimore, Maryland, and York, Pennsylvania. This traverse controlled in Pennsylvania an area of 500 square miles, included in two quadrangles.

In addition to directing and supervising the work of the other triangulators, Mr. S. S. Gannett measured a primary base on the line of the Pennsylvania Railroad near Hillside and occupied numerous stations in the areas in which the various parties were working, either in the course of the supervision of their work or in conjunction with them.

Prof. A. H. Thompson was engaged in extending triangulation in the general neighborhood of Indiana and Greensburg; Mr. E. L. McNair between Indiana and Clarion; Mr. Walter R. Harper between Uniontown, Greensburg, and Pittsburg; Mr. D. L. Baldwin between Beaver and Pittsburg; Mr. Sledge Tatum between Morgantown, West Virginia, and Uniontown, Pennsylvania, also between Chambersburg, McConnellsburg, Everett, and Altoona; Mr. Oscar Jones between Elmira, New York, and Tioga, Blossburg, and Williamsport, Pennsylvania.

The gross results of the field work of these parties was the occupation and monumenting of ninety-eight separate stations, the establishment of nine meridian marks, and the furnishing of primary control for 7,500 square miles, included within the limits of thirty-three 15-minute quadrangles.

Maryland.—In conjunction with the extension of primary triangulation into the neighborhood of Chambersburg, Pennsylvania, Mr. Sledge Tatum occupied four stations in the vicinity of Hagerstown, Maryland. These furnished control for 500 square miles, included within the borders of two 15-minute quadrangles.

The primary railroad traverse previously referred to as having been extended by Mr. W. Carvel Hall between Baltimore, Maryland, and York, Pennsylvania, consisted in the running of such traverse over the lines of the Northern Central Railway, the Western Maryland Railway, and the Baltimore and Lehigh and York Southern railways. In all there were run 200 miles of such traverse, which furnished control for 750 square miles, covered by three 15-minute quadrangles, within the State of Maryland, in addition to the area which was controlled by the same traverse in the State of Pennsylvania.

Maine.—During the month of August Mr. W. T. Griswold, topographer, occupied eight stations while extending primary triangulation in the neighborhood of Bangor. These furnished control for 850 square miles, included within the limits of four 15-minute quadrangles.

West Virginia.—During the month of April Mr. W. T. Griswold, assisted by Mr. Sledge Tatum, extended primary triangulation between Oakland, Maryland, and Morgantown, West Virginia. In the course of this work they occupied and monumented seven stations, furnishing primary control for 450 square miles, included within the limits of two 15-minute quadrangles.

Alabama-Georgia.—During portions of the months of May and June Mr. Griswold extended primary triangulation from the neighborhood of Cedartown, Georgia, to Wedowee, Alabama. In the course of this work he monumented and determined the positions of ten stations, thereby furnishing control for 2,000 square miles, included within the limits of two 30-minute quadrangles.

CENTRAL SECTION.

In June, 1899, secondary triangulation was extended over the 30-minute quadrangle in Lincoln County, Nebraska, south of Brady Island. Two old stations and six new ones were occupied by Mr. George T. Hawkins, topographer.

The rest of the control established during the season in this topographic section was by primary railroad traverse. In the latter part of June Mr. Hawkins controlled by this method the West Union quadrangle, in northeastern Iowa, traversing a distance of 90 miles along the Burlington, Cedar Rapids, and Northern Railroad, from Independence to North McGregor.

The first week in July the quadrangle immediately north of St. Paul and Minneapolis, Minnesota, was controlled by a line 40 miles in length.

During the remainder of July and the month of August Mr. Hawkins ran a traverse from a triangulation station of the United States Coast and Geodetic Survey near Madison, Wisconsin, northwestward to an astronomic station of the United States Lake Survey near Valley Junction, thence northeastward to the triangulation station of the same organization near Fort Howard, the total distance traversed, including spur lines in Taylor and Langlade counties, being 391 miles. This controlled an area of several thousand square miles.

In the first half of September, 87 miles of traverse were run in the vicinity of Toledo, Ohio, radiating from St. Mary's Church spire, previously located by the United States Lake Survey.

During the latter part of September and the early part of October the traverse party of Mr. Hawkins controlled portions of Vanderburg, Warrick, Dubois, Pike, and Gibson counties, in southern Indiana, the line starting from the astronomic station of the United States Coast and Geodetic Survey at Henderson, Kentucky, and completing a circuit 115 miles in length.

During the field season meridian lines were established at five county seats in Wisconsin and two in Indiana.

ROCKY MOUNTAIN SECTION.

Mr. H. L. Baldwin, jr., topographer, completed the control of four 30-minute quadrangles in the vicinity of Denver, Colorado, a total of twenty-four stations having been occupied

In addition, numerous church spires, section corners, and other secondary points were located. Mr. Baldwin also established meridian lines at Greeley and Golden.

The Maricopa, Arizona, base line was measured twice with a 300-foot steel tape by Mr. T. M. Bannon, topographer, during the winter of 1899–1900. Mr. Bannon also observed a check azimuth near Globe and occupied seven stations, controlling one 30-minute quadrangle.

In the spring of 1900 Mr. R. H. Chapman, topographer, extended triangulation southwestward from stations in the Indian Territory triangulation, so as to control the Gainesville and Montague quadrangles in Texas. He occupied twelve stations, located five points by intersection, and established a meridian line at Montague.

PACIFIC SECTION.

An area of about 5,000 square miles, lying partly within the Colville Indian Reservation in northeastern Washington, was controlled by Mr. C. F. Urquhart, topographer, who occupied sixteen stations during the field season. This work is based upon stations in the Spokane base expansion.

In November Mr. Urquhart occupied three 3-point stations in northern California for the control of the Redding quadrangle.

Mr. R. U. Goode, geographer, was engaged in triangulation for the control of the area of the Bingham, Utah, special sheet from September 29 to October 7. He occupied three 3-point stations.

FOREST RESERVES.

Primary control for the mapping of the forest reserves was established in the Pacific section as follows:

Mount Rainier Reserve, Washington.—During June, 1899, Mr. A. H. Sylvester, topographer, extended the triangulation previously executed by him southward from the Yakima quadrangle, occupying seven additional stations and controlling an area of 2,000 square miles.

Washington Reserve, Washington.—Triangulation of the previous season was continued by Mr. Sylvester to the northeastward of Lake Chelan, six new stations, together with five stations of previous work, being occupied, furnishing control for three 30-minute quadrangles.

Division of Topography.

ATLANTIC SECTION.

Topographic work was carried on during the season by eighteen parties, working in ten States—New York, Pennsylvania, Maryland, Maine, Ohio, North Carolina, Tennessee, Georgia, Alabama, and West Virginia. The survey of thirty-four quadrangles was completed, of which thirty were on the scale of 1:62500, with a contour interval of 20 feet, and four were on the scale of 1:125000, with contour intervals of 50 to 100 feet. In addition, the survey of nineteen quadrangles was partially completed, of which fourteen were on the scale of 1:62500, with a contour interval of 20 feet, two were on the scale of 1:125000, with a contour interval of 100 feet, and two were on the scale of 1:20000, with a contour interval of 20 feet. The total area surveyed was 10,267 square miles, of which 6,922 square miles were on the scale of 1:62500 and 3,345 square miles were on the scale of 1:125000. Levels were run over 5,549 linear miles, resulting in the establishment of 517 permanent bench marks.

New York.—Work was carried on under the cooperative topographic agreement made with the State of New York, whereby that State appropriated $19,500 for the work and the Director of the United States Geological Survey allotted a like amount. There were maintained on such work during the season eight parties. Mr. J. H. Jennings, topographer, was placed in general charge of a group of three parties, headed by Messrs. J. H. Wheat and J. W. Thom, topographers, and N. G. Van Doren, assistant topographer. In addition, Mr. James McCormick, topographer, had charge of a portion of the work under Mr. Jennings's direction. These parties commenced field work about the middle of April and were disbanded in October. For about two months after July 1 Mr. Jennings and his assistants were temporarily transferred to the State of Pennsylvania, for field work there. During the season these parties completed the mapping of nine quadrangles—the Palmyra, Clyde, Sodus Bay, Weedsport, Geneva, Phelps, Ovid, Genoa, and Waverly, in Cayuga, Seneca, Wayne, Ontario, Yates, Tompkins, Chemung, and Tioga counties. They also completed the control of and partly surveyed three others—the Penn Yan, Canandaigua, and Hammondsport, in Yates, Ontario, Schuyler, and Steuben counties. Mr. W. H. Lovell, topographer, completed the survey of the Saratoga and Broadalbin quadrangles and the control and partial mapping of the Luzerne quadrangle, in Fulton, Saratoga, and Warren counties. Mr. C. C. Bassett, topographer, assisted for a little over a month by Mr. McCormick, completed the survey of the Millbrook and Schunemunk quadrangles, in Dutchess, Orange, and Ulster counties. Mr. A. M. Walker, topographer, assisted by Mr. A. H. Bumstead, assistant topographer, and for two months by Mr. N. G. Van Doren, assistant topographer, completed the survey of the Morrisville and Raquette Lake quadrangles, in Madison and Hamilton counties, and the control and partial mapping of the Blue Mountain, Richfield Springs, and Berne quadrangles, in Hamilton, Herkimer, Otsego, Schoharie, and Albany counties. All of these parties commenced field work about the middle of April and disbanded in the months of October and November. The map work in New York was on a scale of 1:62500, with a contour interval of 20 feet, and embraced an area of finished topography aggregating 3,308 square miles. In connection with the above 2,278 miles of primary levels were run and 152 permanent bench marks were established.

During the months of April and May Mr. E. L. McNair ran a line of precise levels between the United States Engineers bench mark at Schenectady, via Saratoga, to the United States Geological Survey bench mark at North Creek. The route of these levels was over the line of the Delaware and Hudson River Railroad. In all 81 miles of double-rodded levels were run and 12 permanent bench marks were established.

Pennsylvania.—Work was prosecuted under the cooperative topographic agreement entered into between the State survey commissioners of Pennsylvania and the Director of the United

States Geological Survey, whereby the State appropriated $17,000 for the work, and the Director of the Survey allotted a like amount. There were maintained on such work during portions of the season six parties. Mr. Frank Sutton, topographer, was placed in general charge of a group of three parties, headed by himself and Messrs. R. D. Cummin and A. C. Roberts, topographers. During the season these parties completed the mapping of four quadrangles—the Erie, Girard, Uniontown, and Masontown, in Erie, Crawford, Fayette, and Greene counties. In addition, they completed the control and a portion of the mapping of the Brownsville and Connellsville quadrangles, in Fayette, Washington, and Westmoreland counties. During the months of July, August, September, and October Mr. J. H. Jennings, topographer, assisted by Messrs. J. H. Wheat and J. W. Thom, topographers, and by Mr. A. H. Bumstead, assistant topographer, completed the mapping of the Elkland and Gaines quadrangles and the control of the Tioga and a portion of the Antrim and Mercersburg quadrangles, in Tioga County. Mr. Sutton's parties commenced field work early in April and were disbanded early in November. The area surveyed in Pennsylvania was mapped to a scale of 1:62500, with a contour interval of 20 feet, and aggregated 1,257 square miles of finished topography. In connection with this 526 linear miles of spirit levels were run and 53 permanent bench marks were established.

During the months of May, June, and July Mr E. L. McNair, and during the months of September and November Mr. C. H. Semper, ran lines of precise levels as follows: From a bench mark of the United States Coast and Geodetic Survey transcontinental levels at Grafton, West Virginia, via Uniontown and Brownsville, Pennsylvania, to Pittsburg; also from a bench mark of the precise levels of the Geological Survey at Redhouse, near Salamanca, New York, via Warren, Oil City, and Franklin, Pennsylvania, to Pittsburg; also from a bench mark of the United States Engineers at Erie, Pennsylvania, via Meadville, to Franklin; also from a bench mark on the line of precise levels of the Geological Survey near Elmira, New York, over the Northern Central Railway, to Williamsport. At Pittsburg connection was made with the bench marks of the precise levels of the Pennsylvania Railroad, thus giving practically four independent checks on the elevation of the Pittsburg datum, all of which agreed within a remarkably small limit of error. At Williamsport connection was made with the precise levels of the Pennsylvania Railroad and the difference of elevation found was transferred to the bench mark of the Pennsylvania Railroad precise levels at Harrisburg and connection made between this and the bench mark of the United States Coast and Geodetic Survey precise levels, thus determining the elevation of the Harrisburg datum by four separate routes of levels, two of these being by different lines of the Coast Survey. All of the precise leveling executed by the Geological Survey comprised the running of 533 miles of duplicate-rodded lines and the establishment of 96 permanent bench marks. The details of the closures of the work of the Geological Survey on the lines of precise levels of the other organizations named are published in the Appendix to this report.

Maryland–Pennsylvania–West Virginia.—Work was prosecuted under the cooperative agreement entered into between the State geologist of Maryland and the Director of the United States Geological Survey, whereby $5,000 was appropriated by the State and a like sum was allotted by the Director of the Survey. There were maintained on such work during the season two parties. The portions of Pennsylvania and West Virginia surveyed in connection with the filling out of quadrangular areas were mapped exclusively at the expense of the Federal Government. Mr. W. Carvel Hall was placed in general charge, with Mr. W. N. Morrill, assistant topographer, as aid. Field work was commenced about the middle of April and the parties were disbanded in November. During the season these parties completed the mapping of five quadrangles—the Oakland, which work, with that in the adjoining portion of Garrett County, Maryland, was a resurvey of the area of the existing 2-mile Piedmont sheet; the Cecilton and Betterton quadrangles, in Harford, Cecil, and Kent counties, which work was a resurvey of portions of the area of the existing 2-mile Tolchester and Dover sheets, and the Hancock and Havre de Grace quadrangles, in Washington, Harford, and Cecil counties, Maryland, and Chester, Lancaster, Franklin, and Fulton counties, Pennsylvania, and Morgan County, West Virginia. In addition, Chestertown, a portion of Tolchester quadrangle, was partially resurveyed and the control for Belair was completed. Finally, spirit levels were run, in addition to those for the above quadrangles, over portions of Talbot, Caroline, and Queen Anne counties for the control of future mapping. All of the above work was on the scale of 1:62500, with a contour interval of 20 feet, and embraced an area within the three States of 1,469 square miles of completed topography. The spirit leveling aggregated 555 linear miles, in the course of which there were established 42 permanent bench marks.

Maine.—Work was prosecuted under the cooperative topographic agreement between the topographic survey commissioners of the State of Maine and the Director of the United States Geological Survey, whereby the State appropriated $2,500 for the seasons of 1899 and 1900 and the Director ot the Survey allotted a like amount. There was maintained on such work during the season, from May 1 to October, one party, under charge of Mr. E. B. Clark, topographer. This party completed the survey of the Bucksport and Orland quadrangles, in Penobscot, Waldo, and Hancock counties. The scale of work was 1:62500, with a contour interval of 20 feet, and the area mapped was 426 square miles, in connection with which 307 miles of primary levels were run and 12 permanent bench marks were established.

Ohio.—Mr. Hersey Munroe, topographer, was in charge of a party engaged in mapping two quadrangles in the vicinity of Columbus from the 1st of May until the middle of August, when he was transferred to Tennessee. He completed the mapping of two quadrangles in Franklin, Pickaway, and Fairfield counties, on a scale of 1:62500, with a contour interval of 20 feet. The area mapped was 462 square miles, in connection with which 312 miles of primary levels were run and 22 permanent bench marks were established.

West Virginia.—During a portion of the month of July and in August and October Mr W. N. Morrill completed, under the general supervision of Mr. Frank Sutton, the control of the Morgantown quadrangle, in Monongalia County, on a scale of 1:62500. In connection with this 41 miles of spirit levels were run and 4 permanent bench marks were established.

Mr. Albert Pike, topographer, was in charge of a party engaged in completing the resurvey of the Nicholas quadrangle, in Nicholas and Greenbrier counties. Field work was commenced early in May and was continued until about the middle of August, when the survey of this quadrangle was completed and the party was transferred to Tennessee. There was mapped, on the scale of 1:125000, with a contour interval of 100 feet, an area of 400 square miles, in connection with which 34 miles of spirit levels were run and 14 permanent bench marks were established.

North Carolina.—Mr. W. L. Miller, topographer, was in charge of a party engaged in completing the resurvey of the Asheville quadrangle, in Madison and Haywood counties, North Carolina, and Cocke County, Tennessee, and of a portion of the Morganton quadrangle, in Burke and Caldwell counties, from the middle of April until the 1st of September, when he was transferred to field work in Alabama and Georgia. He completed the mapping, on a scale of 1:125000, with a contour interval of 100 feet, of 848 square miles, in connection with which 92 miles of spirit levels were run and 9 permanent bench marks were established.

Mr. Glenn S. Smith, topographer, was in charge, under the general supervision of Mr. Miller, of a resurvey of a portion of the Mount Mitchell quadrangle, in McDowell and Yancey counties. Field work was commenced about the middle of April and was discontinued about September 1, when the party was transferred to Georgia and Alabama. There was completed, on the scale of 1:125000, with a contour interval of 100 feet, an area of 350 square miles, in connection with which 90 miles of levels were run and 11 permanent bench marks were established.

Tennessee.—Messrs. Hersey Munroe and Albert Pike were in charge of parties engaged in mapping, respectively, the north and south halves of the Columbia quadrangle, in Hickman, Williamson, and Maury counties. The former was transferred about the middle of August from field work in Ohio, and the latter at the same time from field work in West Virginia. A month later Mr. N. G. Van Doren was transferred from New York to aid in this work. By December these parties had completed the mapping, on a scale of 1:125000, with a contour interval of 50 feet, of 750 square miles, in connection with which 311 miles of spirit levels were run and 33 permanent bench marks were established.

During the period from August to November, inclusive, Mr. W. W. Gilbert, under the supervision of Mr. Munroe, ran a line of precise levels from the bench mark established on the precise-level line of this Survey at Cleveland, Tennessee, via the Southern Railway to Chattanooga, and the Nashville, Chattanooga and St. Louis Railroad, via Decherd and Columbia, to Nashville In all, 215 linear miles of duplicate-rodded levels were run and 35 permanent bench marks were established.

Georgia-Alabama.—The topographic mapping of the Wedowee quadrangle, in Randolph and Chambers counties, Alabama, and Heard and Troup counties, Georgia, was prosecuted under a partial cooperative agreement with the State geologist of Alabama, whereby he allotted $1,000 to field work in his State and the Director of the United States Geological Survey allotted the remainder required for the survey planned. Mr. W. L. Miller was placed in charge of one party and Mr. Glenn S. Smith of another, the former to map the northern half and the latter the southern half of the Wedowee quadrangle. These topographers were transferred about September 1 from field work in North Carolina. By December they had completed the survey of 997 square miles, on a scale of 1:125000, with a contour interval of 50 feet, in connection with which 174 miles of spirit levels were run and 22 permanent bench marks were established.

CENTRAL SECTION.

Eleven topographic parties were maintained during the season in the States of Wisconsin, Minnesota, Iowa, Nebraska, Illinois, Ohio and Michigan, Indiana, Missouri, and Arkansas, one party working in Arkansas throughout the winter. The whole of fifteen complete quadrangles and portions of four others were surveyed, also an irregular area of 177 square miles in the Mesabi Range of Minnesota, and 33 square miles in the vicinity of Tower and Ely in the same State. In addition to the regular topographic work the culture in the districts in the vicinity of Chicago, Illinois, and Milwaukee, Wisconsin, was revised, as well as parts of various other quadrangles in Nebraska and Wisconsin, the total area of revision being 2,015 square miles. The total area surveyed was 10,639 square miles, of which 3,570 were on the scale of 1:62500, 7,069 on the scale of 1:125000, and 28 on the special scale of 1:15840. Levels were run over 2,602 linear miles, resulting in the establishment of 306 permanent bench marks.

Wisconsin.—Field work was commenced in this State on June 1 by Mr. W. H. Griffin, topographer, assisted by Mr. Basil Duke, topographer, and was continued until the end of July, when the Dells quadrangle was completed and the party was transferred to Minnesota. The area surveyed includes parts of Sauk, Juneau, Adams, and Columbia counties and comprises 216 square miles, on the scale of 1:62500, with a contour interval of 20 feet. In connection with this work 130 miles of levels were run and 11 permanent bench marks were established.

Mr. R. C. McKinney, topographer, commenced work about June 10 and was engaged in Wisconsin until August 30, at which time he was transferred to Indiana. During this time he mapped the Poynette 15-minute quadrangle, area 217 square miles, and revised the Portage 15-minute quadrangle, area 216 square miles. This work was on the scale of 1:62500, with a contour interval of 20 feet, and is embraced in the counties of Marquette, Columbia, and Dane. In connection with the above 150 miles of levels were run and 15 permanent bench marks were established.

Upon the completion of revision work in Illinois, referred to elsewhere, Mr. Nat Tyler, jr., topographer, was ordered to Milwaukee for the purpose of revising the Milwaukee, Waukesha, Bay View, and Muskego quadrangles, and was engaged on this work until October 10, when he was ordered to Washington for office duty. This work was on the scale of 1:62500, with a contour interval of 20 feet, and covered portions of Milwaukee, Waukesha, and Racine counties. The area revised comprised 720 square miles.

Mr. Robert Muldrow, topographer, was engaged in Wisconsin from May 15 to November 1, during which time he mapped the Marathon and Wausau special quadrangles, in Marathon, Lincoln, and Langdale counties. The area mapped was 1,368 square miles, on the scale of 1:125000, with a contour interval of 20 feet, in connection with which 324 miles of levels were run and 20 permanent bench marks were established.

Minnesota.—On the completion of the work in Wisconsin, Mr. Griffin and his assistant, Mr. Duke, commenced operations in the White Bear and Anoka quadrangles, included in portions of Washington, Ramsey, Hennepin, and Anoka counties. This work was on the scale of 1:62500, with a contour interval of 20 feet, and comprised an area of 422 square miles, in connection with which 170 miles of levels were run and 17 permanent bench marks were established.

On June 1 Mr. E. C. Bebb, topographer, commenced special work in the mining districts of St. Louis County, Minnesota. He was engaged in the Tower district through June and a portion of July, surveying 20 square miles on the scale of 1:15840, with a contour interval of 10 feet, in connection with which 21 miles of levels were run.

On July 7 Mr. Bebb commenced work in the Ely mining district, which occupied him until the latter part of July. The scale of this work was 1:15840, with a contour interval of 10 feet, and comprised an area of 8 square miles, in connection with which 18 miles of levels were run.

A separate area of about 5 square miles near Tower was also surveyed, on the scale of 1:62500, with a contour interval of 20 feet.

On July 26 Mr. Bebb's party was transferred to the Mesabi Range, where work was continued until the close of the season, October 27, when Mr. Bebb was ordered to Washington for office duty. The area surveyed in the Mesabi Range was a narrow irregular strip along the iron-bearing formations of the range, extending from Biwabik on the east to a point 6 miles west of Hibbing, and comprising 177 square miles. The work was on the scale of 1:62500, with a contour interval of 20 feet, in connection with which 106 miles of levels were run.

Iowa.—Field work was commenced in this State by a party in charge of Mr. M. Hackett, topographer, on May 20, and was continued until December 7, during which time the West Union quadrangle and the northeast quarter of the Marion quadrangle, with some adjacent territory in the northwest quarter of the Marion quadrangle, were surveyed, covering portions of Delaware, Buchanan, Fayette, and Clayton counties. This work embraced an area of 1,190 square miles, and was on the scale of 1:125000, with a contour interval of 20 feet, and in connection with it 314 miles of levels were run and 24 permanent bench marks were established.

Nebraska.—Field work was commenced in this State June 1 by a party in charge of Mr. C. W. Goodlove, topographer, and was continued until November 15. The area surveyed was included in the North Platte and Gothenburg quadrangles, in Lincoln, McPherson, Logan, Dawson, and Frontier counties. Of the work in the North Platte quadrangle, 449 square miles was new and 449 square miles was revision. In the Gothenburg quadrangle 679 miles were surveyed, the remaining portion—the northeast quarter—having been mapped by Mr. Peters in 1894. This work was on the scale of 1:125000, with a contour interval of 20 feet, and in connection therewith 248 miles of levels were run and 97 permanent bench marks were established.

Illinois.—Mr. Nat. Tyler, jr., topographer, took the field on April 17 for the purpose of revising the Chicago, Calumet, Desplaines, and Riverside quadrangles, and continued on this work until July 1, when he was transferred to Wisconsin. The work was on the scale of 1:62500, with contour intervals of 5 and 10 feet, and covered portions of Cook, Dupage, and Will counties. The area surveyed comprised 630 square miles.

From December 8 to 19 Mr. E. C. Bebb was engaged in revising parts of the Danville (Illinois) quadrangle.

Ohio-Michigan.—Field work was commenced in this district early in July by a party in charge of Mr. Charles E. Cooke, topographer, and continued until November 20, during which time the Toledo, Maumee Bay, and Oak Harbor quadrangles, comprising the city of Toledo and vicinity, in Lucas, Wood, and Ottawa counties, Ohio, and Monroe County, Michigan, were surveyed. The area mapped was 500 square miles, on the scale of 1:62500, with a contour interval of 20 feet. In connection with this work 168 miles of levels were run and 20 permanent bench marks were established.

Indiana.—On the completion of the work in Wisconsin, Mr. R. C. McKinney was transferred to Indiana, on September 1, and continued in this section until November 8, during which time he completed the mapping of the Boonville and Petersburg quadrangles, in portions of Vanderburg, Gibson, Warrick, and Pike counties. This work comprised an area of 467 square miles, on the scale of 1:62500, with a contour interval of 20 feet, in connection with which 138 miles of levels were run and 16 permanent bench marks were established.

Missouri.—Field work was commenced in this State on July 1 by Mr. Paul Holman, topographer, and was continued until November 26, when the Union quadrangle was completed and Mr. Holman returned to the Washington office. This quadrangle lies in parts of Franklin, Gasconade, Crawford, and Washington counties and comprises an area of 938 square miles. The scale of the work was 1:125000, with a contour interval of 50 feet, in connection with which 291 miles of levels were run and 24 permanent bench marks were established.

Arkansas.—Field work was commenced in this State by a party in charge of Mr. H. B. Blair, topographer, with Mr. Duncan Hannegan, topographer, as assistant, on July 1, and was continued until November 1, when Mr. Blair returned to the Washington office. During this time the Fayetteville and a portion of the Siloam Springs quadrangles were surveyed, covering an area of 1,140 square miles, in Washington and Benton counties. This work was done on the scale of 1:125000, with a contour interval of 50 feet, and in connection with it 227 miles of levels were run and 28 permanent bench marks were established.

On the completion of the above work Mr. Duncan Hannegan, on November 20, commenced the survey of the Prescott quadrangle, which was completed on March 15, 1900. This quadrangle lies in portions of Pike, Clark, Hempstead, Nevada, and Ouachita counties and covers an area of 856 square miles. The work was done on the scale of 1:125000, with a contour interval of 50 feet, and in connection with it 297 miles of levels were run and 34 permanent bench marks were established.

ROCKY MOUNTAIN SECTION.

Topographic work was carried on by one party in Montana, one in Wyoming, one in South Dakota, and one in Colorado. After the close of the season in the more northerly areas three parties were organized for work in Colorado, Arizona, and Texas; some work was also completed in Texas in the first part of the field season. The total area surveyed was 4,554 square miles, of which 4,384 was on the scale of 1:125000, 115 on th scale of 1:62500, and 55 on the scale of 1:31250. Levels to the extent of 1,568 miles were run and 387 permanent bench marks were established.

Montana-Wyoming.—Between June 1 and November 23 Mr. R. H. Chapman, topographer, completed the necessary triangulation and made topographic surveys on the scale of 1:31250, with 50-foot contours, of 45 square miles in the vicinity of Marysville, Lewis and Clarke County, and of 10 square miles at Elkhorn, Jefferson County, Montana. In connection with this work 170 miles of levels were run and 34 bench marks were established. Mr. Chapman also made a detailed survey of the hot-spring area at The Thumb Yellowstone National Park.

Wyoming.—Mr. W. H. Herron, topographer, between June 18 and November 11 surveyed 860 square miles of the Newcastle quadrangle, in Weston County, thereby completing the same. The work was on the scale of 1:125000, with a contour interval of 100 feet. The leveling for this area was done by Mr. John T. Stewart, who ran 160 miles and established 44 permanent bench marks.

South Dakota.—Mr. A. F. Dunnington, topographer, with the assistance of Mr. Pearson Chapman, assistant topographer, completed the resurvey of the Hermosa quadrangle, in Custer and Pennington counties, which includes a portion of the Black Hills Forest Reserve. This work was on the scale of 1:125000, with a contour interval of 100 feet. A reconnaissance survey was also extended over the northern third of the Edgemont quadrangle, in Fall River County, between November 6 and 15, by Mr. R. H. Chapman, topographer, and Mr. Pearson Chapman, assistant topographer. The total area mapped was 690 square miles, in connection with which 205 miles of levels were run and 56 permanent bench marks were established.

Colorado.—Early in June Messrs. W. M. Beaman and W. J. Lloyd, topographers, commenced the survey of the Greeley quadrangle, in Weld and Arapahoe counties, on the scale of 1:125000, with a contour interval of 20 feet. During midsummer, while work in the high mountains was practicable, Mr. Beaman surveyed 90 square miles, on the scale of 1.62500 and with a contour interval of 100 feet, of the Needle Mountains quadrangle, San Juan County, and returned to the Greeley work in the fall. Mr. Arthur Stiles, topographer, having completed work assigned him elsewhere, assisted with the Greeley survey after October 22. The total output for the season in Colorado on the scale of 1:125000 was 794 square miles, surveyed as follows: 470 square miles by Mr. Lloyd, 200 square miles by Mr. Beaman, and 124 square miles by Mr. Stiles, in connection with which 187 miles of levels were run and 57 permanent bench marks were established.

Arizona.—At the close of the period covered by the last annual report leveling had just been commenced by Mr. Thomas Winsor for the Tempe and Florence quadrangles, in the vicinity of Phœnix and Florence, in Maricopa and Pinal counties. This was discontinued early in July and resumed in October. Prior to May 1 the leveling had been completed for the quadrangles named, and also for the Globe and Pinal Mountain quadrangles, in Gila and Pinal counties. This leveling consisted of 559 miles, and 141 permanent bench marks were established.

On November 16 Mr. T. M. Bannon, topographer, organized a party for the topographic survey of the Florence quadrangle, on the scale of 1:125000, with a contour interval of 100 feet, and Mr. W. J. Lloyd, topographer, was detailed after January 5 to assist in the work. The area was completed early in April, after which Mr. Lloyd commenced the survey of the Globe quadrangle, on the scale of 1:62500, with a contour interval of 50 feet, and Mr. Bannon undertook to extend triangulation eastward, to afford additional control for the Pinal Mountain quadrangle. Prior to the 1st of May 940 square miles were surveyed, 915 being on the scale of 1:125000, and 25 on the scale of 1:62500.

Texas.—At the close of the last report work was in progress on the resurvey of the Bastrop quadrangle, in Bastrop, Travis, and Williamson counties. Mr. G. E. Hyde, topographer, assisted by Mr. Arthur Stiles, topographer, completed the resurvey, on the scale of 1:125000, with a contour interval of 25 feet, of 620 miles of this quadrangle between May 1 and June 20.

On November 12 Mr. J. F. McBeth, field assistant, took up the resurvey of the Llano quadrangle, in Llano and Mason counties, and prior to May 10 mapped an area of 390 square miles, on the scale of 1:125000, with a contour interval of 25 feet, thereby completing the same.

On March 16 Mr. W. M. Beaman, topographer, outfitted a party at Austin for the resurvey of the Burnet quadrangle, in Burnet, Llano, and Travis counties. Mr. Arthur Stiles, topographer, commenced work on the same quadrangle on March 22. An area of 115 square miles was mapped before May 1, on the scale of 1:125000, with a contour interval of 25 feet.

On December 16 Mr. E. W. Glafcke, levelman, outfitted a party for work on the Montague and Gainesville quadrangles, in Montague and Cook counties. By the 28th of February 146 miles of line had been run and 36 permanent bench marks had been established for the Texas portion of these sheets. On March 1 work was commenced on the Paris and Bonham quadrangles, in Grayson, Fannin, and Lamar counties. Prior to the 1st of May 141 miles of line were run and 19 permanent bench marks were established for these quadrangles.

PACIFIC SECTION.

Topographic work was done in Idaho, Montana, Oregon, Utah, and California. The area surveyed amounted to 2,936 square miles, of which 2,842 square miles were on the scale of 1:125000, 70 square miles on the scale of 1:63360, and 24 square miles on the scale of 1:20000. In connection with the above 1,204 miles of levels were run and 234 permanent bench marks were established.

Idaho.—Mr. Van H. Manning, topographer, was detailed for the survey of the Cœur d'Alene quadrangle, and left Washington for the field on May 8. Field work was commenced on May 15 and continued until November 1, when the party was disbanded on account of adverse weather conditions. From November 4 to 9, inclusive, Mr. Manning was engaged in certain revision work in the Spokane quadrangle, on the completion of which he was directed to proceed to Washington for office duty. Mr. D. C. Harrison, topographer, assisted for a few days just prior to the close of the season on the Cœur d'Alene quadrangle, mapping an area of 20 square miles. The combined work of Messrs. Manning and Harrison amounted to 721 square miles, on the scale of 1:125000, with a contour interval of 100 feet, in connection with which 192 miles of levels were run and 27 permanent bench marks were established. The area surveyed was wholly in Kootenai County.

Idaho-Montana.—In connection with the survey of the Idaho-Montana boundary line an area adjacent to the line, comprising about 70 square miles, was mapped on the scale of 1:63360, with a contour interval of 100 feet. The work was done by Mr. D. L. Reaburn.

Oregon.—Mr. R. H. McKee, topographer, left Washington May 1 with instructions to resume field work in the Baker City quadrangle. The party was organized at Baker City and active field work commenced on May 20. The mapping of the quadrangle was completed about the end of July, when work was commenced on the Sumpter quadrangle, which is immediately west of the Baker City quadrangle. This work was continued until September 22, when Mr. McKee was ordered to field duty in Utah. Mr. J. E. Rockhold, assistant topographer, was with the party throughout the season and continued work after Mr. McKee had left, until November 15, when he was ordered to report for office duty in Washington. The results of the work by Mr. McKee's party were 433 square miles mapped on the scale of 1:125000, with a contour interval of 100 feet, 94 miles of levels run, and 9 permanent bench marks established. The area mapped is included in Baker and Grant counties.

Leveling along the line of the Oregon Railway and Navigation Company was continued by Mr. H. S. Crowe, levelman. The line was run with duplicate rods and was extended to Snake River, near Huntington. A line of levels was also carried with duplicate rods from Umatilla, a station of the line above referred to, to Pasco, a station on the Northern Pacific Railway, in order to connect with a line carried through the latter point the previous season. Mr. Crowe was engaged in the work above referred to from June 1 to October 15, during which time 304 miles of levels were run and 51 permanent bench marks were established.

Utah.—Detailed topographic work was commenced in the area of the Bingham Special sheet on September 29 by Mr. R. H. McKee, topographer, who remained in that vicinity until October 28, when he was compelled to leave the field on account of illness. Mr. W. J. Peters, topographer, on his return from Alaska, before the departure of Mr. McKee, assumed charge of the work on October 19. The party was further increased by Mr. Jeremiah Ahern, topographer, who reported on November 4, and by Mr. E. T. Perkins, jr., topographer, who reported on January 5. The survey was completed on February 21, the area mapped being 24 square miles in Salt Lake County, on the scale of 1:20000, with a contour interval of 50 feet. In connection with this work 15 miles of spirit levels were run and one permanent bench mark was established.

California.—Topographic work was done in three localities—in the vicinity of Napa, north of Santa Cruz, and in southern California. All of this work was surveyed for publication on the scale of 1:125000, to fill out 30-minute quadrangles, portions of which had been previously mapped on the scale of

1:62500. Thus the Napa quadrangle is made up of the Karquines quadrangle, comprising the southeast quarter, and the work of the present year; the Santa Cruz quadrangle is made up of the Palo Alto quadrangle, comprising the, northeast quarter, and the work of the present year; and the Corona quadrangle is made up of the Santa Ana and Anaheim quadrangles, constituting the western half, and the work of the present year.

Mr. L. C. Fletcher, topographer, was detailed for the survey of the Napa quadrangle and left Washington for the field about the middle of April. He was not supplied with a camp outfit, as it was considered more economical for his party to subsist upon the country and hire the necessary transportation, especially as the season in California was to be divided into two parts. Field operations were commenced on April 23 and continued until June 13, when Mr. Fletcher proceeded to the State of Washington for work in the Cascade Mountains in connection with the forest reserves. Work was resumed in California on September 26 and the area assigned was completed on November 19. This area, embracing portions of Napa, Sonoma, and Solano counties, was 615 square miles in extent and was surveyed on the scale of 1:125000, with a contour interval of 100 feet. In connection with the above 383 miles of levels were run and 104 permanent bench marks were established. The leveling done included the necessary work for the Santa Rosa quadrangle, which is immediately west of the Napa quadrangle.

Mr. E. C. Barnard, topographer, was assigned to the survey of the Santa Cruz quadrangle. Leaving Washington about the middle of April, he commenced field work on April 24. The party subsisted upon the country, the necessary horses and vehicles being hired. Mr. Barnard continued in this locality until June 12, when he proceeded to the State of Washington for topographic work in connection with surveys of the forest reserves. He was relieved by Mr. A. B. Searle, topographer, who assumed charge of the party and continued the work until October 22, when the quadrangle was completed. An area of 492 square miles in Santa Cruz and San Mateo counties was mapped on the scale of 1:125000, with a contour interval of 100 feet. In connection with the above 106 miles of levels were run and 18 permanent bench marks were established.

Mr. R. B. Marshall, topographer, on the completion of his work in the Sierra in connection with the survey of the forest reserves, was assigned to duty in southern California. He commenced the mapping of the Corona quadrangle on September 11 and continued until October 8, when he was ordered to proceed to Washington and report for office duty. Mr. Barnard was assigned to succeed Mr. Marshall and commenced work on October 19. Mr. Searle was also assigned to assist on the Corona quadrangle and reported to Mr. Barnard on October 27. The two topographers worked with independent parties and remained in the field until about December 15, when the mapping of the quadrangle was completed. The parties were then disbanded, except that two traversemen continued work, revising the culture on the Santa Ana and Anaheim quadrangles, which are a part of the Corona quadrangle. The area mapped in this locality was 581 square miles, in Orange, Riverside, San Bernardino, and San Diego counties, the scale being 1:125000 and the contour interval 100 feet. Of levels 110 miles were run, and 24 permanent bench marks were established, 4 of the latter being by vertical angulation. On the completion of the work in southern California Messrs. Barnard and Searle were ordered to Washington for office duty.

FOREST RESERVES.

The organization continued as heretofore, certain reserves being assigned to the Rocky Mountain topographic section, under Mr. E. M. Douglas, geographer, and the remaining reserves being assigned to the Pacific section, under Mr. Richard U. Goode, geographer.

ROCKY MOUNTAIN SECTION.

The topographic survey was completed for the Black Hills, Bighorn, and Teton reserves, work was commenced in the Uinta Reserve, and the marking of the boundary line was nearly completed for the Black Hills Reserve. The summary of the work for the section is as follows: Square miles mapped, 4,055; miles of levels run, 655; bench marks established, 140; miles of boundary line marked, 217.

Black Hills Reserve (South Dakota-Wyoming).—At the close of the last report there remained but 95 square miles of this reserve unsurveyed, being a portion of the Sundance quadrangle, in Crook and Weston counties. This area was completed by Mr. W. H. Herron, topographer, on the scale of 1:125000, with a contour interval of 100 feet.

Bighorn Reserve (Wyoming).—Mr. Frank Tweedy, topographer, between June 26 and November 13 completed the resurvey of the Dayton quadrangle, in Bighorn, Johnson, and Sheridan counties, lying partly within and partly without this reserve.

Mr. F. E. Matthes, between July 6 and November 12, completed the Cloud Peak quadrangle, in Johnson and Bighorn counties, and made a reconnaissance survey of about 40 square miles of the reserve east of the same.

The necessary leveling for these quadrangles, as well as that for the Fort McKinney quadrangle, in Johnson County, was completed by Mr. E. W. Glafcke, levelman. The total area surveyed was 1,330 square miles, on the scale of 1:125000, with a contour interval of 100 feet, in connection with which 210 miles of levels were run and 46 bench marks were established.

Teton Reserve (Wyoming).—Mr. T. M. Bannon, topographer, with outfit from Sheridan, and Mr. G. E. Hyde, topographer, with additional camp material from Idaho Falls, Idaho, met early in June at Jacksons Hole, and, after transferring certain portions of the outfit from one party to the other, proceeded with the topographic survey of this reserve. Mr. Arthur Stiles, topographer, assisted in the work after August 10. The Bannon party was disbanded on October 27 and the Hyde party on November 2. The leveling for these parties was done by Mr. Goyne Drummond, who completed his work on December 20. During the season he connected the Teton Reserve elevations with the Oregon Short Line elevations at St. Anthony, Idaho.

The total area surveyed, all of which was included in Uinta County, was 1,870 square miles, on the scale of 1:125000, with a contour interval of 100 feet, in connection with which 268 miles of levels were run and 56 bench marks were established. This completed the survey of the entire reserve and also of the adjoining area on the south.

Uinta Reserve (Utah).—The survey of the Coalville quadrangle, in Summit County, was commenced by Mr. H. L. Baldwin, jr., topographer, on June 14, and by Mr. Jeremiah Ahern, topographer, on July 24. The serious illness of Mr. Baldwin in July delayed work, and a heavy fall of snow in October prevented the completion of the survey. The elevations for this area were determined by Mr. L. C. Woodbury, levelman, who commenced work at Salt Lake City on July 12. The total output was 760 square miles, surveyed on the scale of 1:125000, with a contour interval of 100 feet, in connection with which 177 miles of levels were run and 38 bench marks were established.

Boundaries of reserves.—The Geological Survey was relieved by law, approved March 3, 1899, from the subdivision of lands within or adjacent to forest reserves, but the surveying and marking of the boundaries of the same remained within its jurisdiction. It was decided that it would be inexpedient to undertake the marking of the boundary of any reserve until the reserve had been completely examined and mapped, as changes might result when all the facts were known.

The Black Hills Forest Reserve, in South Dakota and Wyoming, having been entirely mapped, the marking of the boundary was commenced on July 1, by Mr. W. H. Thorn, United States surveyor. During the field season he surveyed and marked 217 miles of line. Inability to find any trace of former land surveys in the vicinity of the remaining 23 miles of boundary made it necessary to refer the matter to the Commissioner of the General Land Office for instructions as to the proper procedure in establishing missing corners. Previous to July 1 Mr. Thorn completed the subdivisional work for two fractional townships.

The posts adopted for the Black Hills Forest Reserve boundaries are similar in size and design to the regular bench-mark posts of the Survey, but they have a special brass cap, as illustrated herewith (fig. 1).

The beveled edge in each of the quadrants was marked so as to indicate the position of the post with reference to the public-land survey corners and to the reserve. The posts are hollow, 3½ inches in outside diameter, 4½ feet in length, and are set 30 inches deep in the ground in a bed of Portland-cement concrete, the interior being filled with cement mortar.

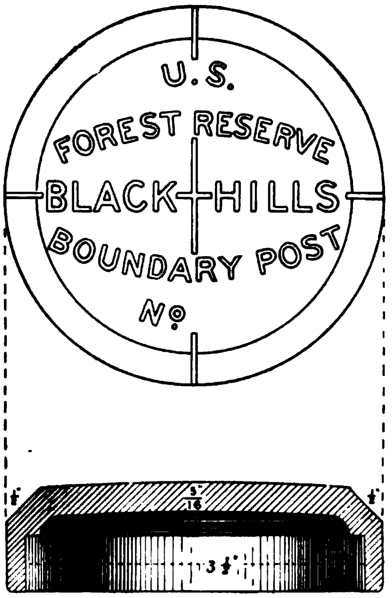

FIG. 1.—Brass cap of posts used to mark the boundary line of the Black Hills Forest Reserve.

PACIFIC SECTION.

Topographic work was prosecuted in or adjacent to the following reserves: Priest River, Washington, Mount Rainier, Sierra, San Bernardino, and San Gabriel. The total area mapped was 4,258 square miles, of which 3,870 square miles were on the scale of 1:125000 and 388 square miles were on the scale of 1:62500. In connection with the above 530 miles of levels were run and 99 permanent bench marks were established.

Priest River Reserve (Idaho).—Topographic work was continued on the Sand Point quadrangle by Mr. D. C. Harrison, topographer, who left Washington on June 1 and commenced field work on June 10. The field season continued until November 4, when the party was disbanded on account of prevailing unfavorable weather, which made it impracticable to operate in the mountains. An area of 397 square miles in Kootenai County was surveyed, on the scale of 1:125000, with a contour interval of 100 feet, thus completing the mapping of the

Sand Point quadrangle. Certain work done by Mr. Harrison in the Cœur d'Alene quadrangle has been referred to under the head of topographic surveys (p. 136).

Washington Reserve (*Washington*).—Work was continued, as during the preceding season, by three topographic parties, one being engaged east and two west of the summit of the Cascade Mountains. The result was the completion of three quadrangles—the Methow, Stillaguamish, and Glacier Peak, the last mentioned having been previously referred to as the Sauk quadrangle.

Mr. R. A. Farmer, topographer, commenced work on the Methow quadrangle on June 15 and completed the area assigned to him October 15. The area surveyed included 678 square miles, all of which was in Okonogan County, in connection with which 192 miles of levels were run and 29 permanent bench marks were established, 5 of the latter being by vertical angulation.

Mr. L. C. Fletcher, topographer, after the suspension of the work upon which he was engaged in California, resumed topographic mapping on June 20 at the point at which he stopped the previous season on the Stillaguamish quadrangle, and completed it September 19. The area surveyed was 300 square miles, in Skagit County.

Mr. E. C. Barnard, topographer, as soon as the weather conditions were favorable for work on and about the summit of the Cascade Mountains, proceeded from California to the State of Washington. He took up the work on the Glacier Peak quadrangle where it had been left by Mr. T. G. Gerdine, topographer, the previous season, commencing on June 20, and completed it on September 8, the area mapped being 215 square miles, in Skagit County.

The scale of all the work above mentioned was 1:125000, with a contour interval of 100 feet.

Upon the completion of his duties in the Washington Reserve Mr. Fletcher returned to California, and Mr. Barnard was directed to proceed to the Yakima Indian Reservation for special duty.

Mount Rainier Reserve (Washington).—Mr. A. E. Murlin, topographer, was detailed for the survey of the Ellensburg quadrangle. He left Washington May 10 and proceeded to Ellensburg via Oakland, Oregon. From the latter point he shipped to Ellensburg the animals and camp outfit used by him the previous season. Field work was begun on May 25, and the survey of the quadrangle was completed on October 28. The area mapped was 820 square miles, including portions of Yakima and Kittitas counties, on the scale of 1:125000, with a contour interval of 100 feet. Levels to the extent of 177 miles were run and 32 permanent bench marks were established. In previous years 16 miles of levels had been run and 5 permanent bench marks had been established in this quadrangle.

Reserves in California.—Mr. R. B. Marshall, topographer, left Washington for the field on May 10, and, after a short leave of absence, resumed field work in the Mount Lyell quadrangle, embracing a portion of the Sierra Reserve, on May 25. He was thus engaged until September 6, during which time he mapped an area of 474 square miles, comprising portions of Mono, Madera, and Mariposa counties, on the scale of 1:125000, with a contour interval of 100 feet. During the preceding season levels were carried and bench marks established over all the accessible portion of the quadrangle, and this work was supplemented by the establishment of 9 additional bench marks by vertical angulation. Upon the completion of the work above referred to Mr. Marshall was directed to proceed to southern California.

Mr. E. T. Perkins, jr., topographer, upon the completion of the triangulation assigned to him in southern California, reference to which was made in the last annual report, commenced topographic work on the San Gorgonio quadrangle on July 21 and completed the same on December 23. The area mapped included 986 square miles, in San Bernardino and Riverside counties, on the scale of 1:125000, with a contour interval of 100 feet. In connection with this work 97 miles of levels were run and 21 permanent bench marks were established.

Mr. W. T. Turner, topographer, continued work in the San

Bernardino and San Gabriel timber-land reserves. On July 1 he commenced the resurvey of the portion of the Redlands quadrangle which was not revised by Mr. Holman in 1898. This revision was completed on September 26. The area surveyed was 142 square miles, on the scale of 1:62500, with a contour interval of 50 feet. Immediately afterwards work was resumed in the San Antonio and Rock Springs quadrangles, portions of which had been surveyed prior to July 1, and was continued until November 25, when the party was disbanded and Mr. Turner returned to Washington for office duty. An area of 246 square miles, in Los Angeles and San Bernardino counties, was surveyed, on the scale of 1:62500, with a contour interval of 50 feet. In connection with the above, 64 miles of levels were run and 8 permanent bench marks were established.

ALASKAN SURVEYS.

FROM LYNN CANAL, VIA HEADWATERS OF WHITE AND TANANA RIVERS, TO EAGLE CITY.

The party organized to explore the region of the headwaters of White, Tanana, and Copper rivers was under the direction of Mr. W. J. Peters, topographer, with Mr. A. H. Brooks, assistant geologist. In addition there were a field assistant and three camp hands.

The expedition disembarked at Pyramid Harbor on May 10, and until May 20 was engaged in preparing the pack train for service, testing instruments and determining their constants, and advancing grain and hay along the trail. The interval from May 25 to 28 was spent in moving from Pyramid Harbor to Dalton Trail post, a distance of 40 miles. At the latter point it was necessary for the party to wait for the snow to melt sufficiently to permit crossing the spur at Dalton Cache, and for the appearance of grass for the subsistence of the pack animals on the trail beyond Rainy Hollow. A start was made on June 22 and, crossing the divide, the party arrived at Tatshenshini River, opposite Northwest Mounted Police Camp, on June 27, a distance of 60 miles.

On June 28 the Tatshenshini, which had a current of 8 to 10 miles an hour, and was at a high stage, was crossed. Some of the horses were swept down to islands below the ford, but were finally rescued. Leaving the post June 30, several minor divides were crossed, one camp being above timber line, and Kaskawulsh River was reached July 12, the distance traveled being about 60 miles. This river is a turbid stream about a mile wide, having a current of about 8 miles an hour, and is filled with numerous sand bars. On July 13 a boat was built and the river was crossed July 14. Traveling up a valley 1 to 2 miles wide, bearing northwesterly for a distance of about 30 miles, the head of this valley and the mouth of O'Connor Glacier, at an elevation of 2,700 feet, were reached on July 17. The waters of this glacier flow from this point into both North Pacific Ocean and Bering Sea drainage.

A descent was now made for about 17 miles through a valley 1 to 2 miles wide, with steep walls, similar to that just ascended, to Lake Kluane, which was reached on July 23. Lake Kluane is about 45 miles long and from 4 to 8 miles wide. Continuing along the southwest shore, Lake Kluane was left July 27, and a valley 5 to 8 miles wide, bearing northwest, was entered. Travel now became difficult on account of thick layers of moss and marshy ground. At 35 miles from Lake Kluane Donjek River was reached, on July 31.

The Donjek is a swift glacial stream a mile or two wide. After crossing the river and ascending the old beds about 2 miles, a valley, bearing northwest, which was moss covered and timbered, was entered and followed for a distance of 30 miles, to Klutlan Glacier. Crossing the stream which issues from the glacier, on August 7 the course was nearly due west, over rolling hills just above timber line, to White River, a distance of 25 miles, where the party arrived August 12. No difficulty was experienced in crossing White River, which is rather broad. An ascent was now made to a pass 6,000 feet in elevation, and descending, Tanana Glacier was reached August 4, the distance from White River being about 40 miles. From the Tanana to Nabesna River, a distance of 40 miles, a pass 6,000 feet high was crossed, and, descending through a narrow canyon, the Nabesna was forded August 22.

The course was now directly toward Chisana Mountain, over rolling, moss-covered hills, through brush and underwood, and the Lowe trail was reached September 1, after about 50 miles of travel. This trail was followed a few miles to Tanana River, which was crossed without difficulty in a boat. Provisions now being low and the horses weak from constant irritation from flies, poor food, and bad footing, it was decided to abandon the plane-table traverse and push on to Eagle City. Following the Lowe trail a day and a half, it was found to bear too far to the east, so the course was changed and Dennison Fork of Fortymile Creek, near the mouth of Mosquito Fork, was reached on September 10.

On September 15 the party reached Eagle City, where the horses and camp equipage were sold at public auction.

Distances for the survey were determined by micrometer measurements, while azimuths and orientation of plane table depend principally on solar observations. About fifteen latitude and twenty azimuth determinations were made, these being approximately evenly distributed along the route. Magnetic variations were determined at every azimuth station. Elevations depend on aneroid readings.

CHANDLAR AND KOYUKUK RIVERS.

The party detailed for the above-mentioned survey was under the direction of Mr. F. C. Schrader, assistant geologist, with Mr. T. G. Gerdine as topographer. In addition there were four assistants rated as camp hands. The party left Seattle May 24, journeying by way of Skagway, White Pass, and Yukon River to Fort Yukon. Work was begun at Fort Yukon on June 22. The routes traveled, with dates, were as follows:

June 22 to 24: From Fort Yukon down Yukon River to the mouth of Chandlar River, a distance of 27 miles.

June 25 to July 5: From mouth of the Chandlar up this river to the mouth of its east fork and entrance into the Romanzof Mountains, a distance of 64 miles.

July 6 to 18: Up Chandlar River from the mouth of the east fork to the head of Chandlar Lake, a distance of 73 miles.

July 19 to 28: Up Chandlar River from the head of Chandlar Lake to Portage Creek, a distance of 56 miles.

July 28 to August 3: From Portage Creek on Chandlar

River, via portage across divide, a rise of 1,100 feet, thence descending along Robert Creek, a tributary of the Middle Fork of Koyukuk River, to navigable water, a distance of 16 miles.

August 4 to 8: Down Robert Creek and Bettles River to the junction of Bettles and Dietrich rivers, a distance of 29 miles.

August 9 to 10: From the junction of Bettles and Dietrich rivers, forming the Middle Fork of Koyukuk River, up Dietrich River, a distance of 19 miles.

August 11 to 12: Return to the junction of Bettles and Dietrich rivers and down the Middle Fork of Koyukuk River to the mouth of Slate Creek, a distance of 36 miles. At this point the party divided. The main party continued down the Middle Fork of Koyukuk River, and the other party, under the direction of Mr. D. C. Witherspoon, ascended Slate Creek, portaged across a low divide between the drainage of the Middle and South forks of Koyukuk River, and descended the South Fork of Koyukuk River to its junction with the Middle Fork, where commences the main Koyukuk River. The distance thus traveled by the subparty was 130 miles.

August 13 to 21: The main party continued from the mouth of Slate Creek down the Middle Fork of Koyukuk River to Peavey and 4 miles below to the mouth of the South Fork of the Koyukuk, a distance of 99 miles.

August 22 to 24: From the mouth of the South Fork of the Koyukuk down that river to Bergman and Arctic City, a distance of 47 miles.

August 25 to 27: Remained in Bergman.

August 28 to September 13: From Bergman down Koyukuk River to its mouth, a distance of 441 miles.

September 14: From the mouth of Koyukuk River down the Yukon to Nulato, a distance of 22 miles. At Nulato the survey was discontinued.

September 16 the party left Nulato on river steamboat and reached St. Michael on September 21.

September 21 to 29: Remained in St. Michael.

September 29 the party crossed Norton Sound by steamer from St. Michael to Nome City, and was engaged intermittently until October 17 in making a detailed topographic map in the immediate vicinity of Nome City.

October 20 passage was taken on steamer *Roanoke* for Seattle, which was reached on November 1.

The total distance traversed on the Chandlar and Koyukuk River surveys was 1,059 miles, which included about 30 miles of portage, the remaining distance traveled being chiefly by canoes.

The topographic survey was carried forward by stadia to the mouth of the East Fork of Chandlar River. Near this point a base line was measured, from which, by expansion, a series of points were located. From these points the work was carried forward by means of plane-table triangulation and sketches from the various stations, the elevations being dependent on vertical angles. From the mouth of Slate Creek, on the Koyukuk, to Nulato, on the Yukon, the work was carried forward by stadia.

The topographic survey of the South Fork of the Koyukuk is dependent on prismatic compass for direction, the various distances being determined by pacing, resection, and timing the current.

Observations for latitude and azimuth were taken as often as practicable.

Further details relating to work near Nome City may be found in a special advance publication entitled Preliminary Report on the Cape Nome Gold Region, Alaska, with Maps and Illustrations: Senate Document No. 236, Fifty-sixth Congress, first session.

IDAHO-MONTANA BOUNDARY LINE.

Work was resumed on this line by a party under Mr. D. L. Reaburn, the party being organized at Leonia about the middle of June. The condition of the work at the conclusion of the previous field season was this: A random line had been run from the crest of the Bitterroot Mountains to the international boundary. During the following office season, after an adjustment of the random line to the triangulation had been made, tables were prepared showing the exact offsets to be applied at each transit station in order to locate the true line. There were also prepared in the office sheets on which all available data were plotted, to be used in sketching the topography. It then remained to establish the monuments on the true line, to cut out and blaze the line, to secure data for the preparation of the final map, and also to remeasure with the steel tape the northern section of the line, a distance of about 6 miles. All of this work was completed on October 5. Mr. Reaburn then was ordered to Washington, after a short service elsewhere, for the purpose of preparing the final notes and plats. The map was drawn to the scale of 1 mile to the inch, the topography being shown in contours with an interval of 100 feet. Four copies of the notes and plats were prepared, one for filing in the General Land Office, one for filing in the office of the surveyor-general of Idaho, one for filing in the office of the surveyor-general of Montana, and one to be retained in the office of the Geological Survey.

The maps and notes, other than those to be retained in this office, were forwarded to the Secretary of the Interior under date of February 3, 1900.

NINETY-EIGHTH MERIDIAN.

An act of Congress approved on June 28, 1898, (Stat. L., vol. 30, p. 495), provided:

> That the United States shall survey and definitely mark and locate the ninety-eighth (98th) meridian of west longitude between Red and Canadian rivers before allotment of the lands herein provided for shall begin.

At the request of the Secretary of the Interior this office prepared an estimate of the "cost of surveying and establishing the ninety-eighth meridian and obliterating the marks and corners upon the existing boundary line and making a subdivision survey," which estimate was transmitted on November 30, 1898, and published in Senate Document No. 33, Fifty-fifth Congress, third session.

An appropriation of $6,300 was made for the work in the general deficiency bill approved March 3, 1899, and the surveys were placed under the supervision of the Director of the Geological Survey.

Through the courtesy of the Superintendent of the Coast and Geodetic Survey an astronomic station was established at Marlow, Indian Territory, which was found to be 11,646.6 feet east of the ninety-eighth meridian.

The field work was placed under the direction of Mr. E. M. Douglas, geographer, and Mr. W. A. Lindsay was appointed United States surveyor. The work was commenced on May 15, considerable delay having been caused by storms and floods.

Subdivisional surveys were made for the triangular strip between the new and old lines and the new line was marked by hollow round iron mile posts, each 5 feet in length and having a brass cap lettered as follows:

U. S. GEOLOGICAL SURVEY.
250 dollars fine for destroying this mark.
OKLAHOMA
BOUNDARY

LINE
INDIAN TER.
Mile ——.

Each post was set 3 feet in concrete and a mound of earth 18 inches in height and 5 feet in diameter was raised around it.

The necessary plats and triplicate copies of the field notes have been prepared and transmitted to the Secretary of the Interior.

The length of the line was about 92 miles, and 95 posts were established.

YAKIMA RESERVATION BOUNDARY LINE.

In the fall of 1898 Mr. E. C. Barnard, topographer, after his return from Alaska, was detailed to make an examination of the existing boundary line of the Yakima Indian Reservation, with a view of determining whether that line conformed to the provisions of the treaty under which the land was set aside for the use of the Indians. After working for a short time he was forced to suspend operations on account of the deep snow in the mountains. On the 16th of September, 1899, work was resumed and continued until October 15. A reconnaissance survey of about 550 square miles was made, and sufficient data were secured for a map and a report covering the facts in the case. The final report and map were submitted to the Secretary of the Interior on January 16, 1900.

Office Work.

On account of lack of space in the Hooe Building, it was found necessary to move a portion of the topographic office force temporarily to the old Post-Office Department building, now under control of the Department of the Interior.

The table herewith shows the atlas sheets, numbering 96, which were completed and submitted for engraving during the year.

Topographic sheets completed in office during 1899–1900.

State and sheet.	Scale.	Contour interval.
ALABAMA-GEORGIA:		*Feet.*
Wedowee	1:125000	50
ARKANSAS:		
Fayetteville	1:125000	50
Prescott	1:125000	50
ARIZONA:		
Florence	1:125000	100
CALIFORNIA:		
Capistrano	1:125000	100
Corona	1:125000	100
Deep Creek	1:62500	50
Hesperia	1:62500	50
Napa	1:125000	100
Mount Lyell	1:125000	100
Santa Cruz	1:125000	100
Redlands (resurvey)	1:62500	50
San Gorgonio	1:125000	100
IDAHO:		
Sand Point	1:125000	100
ILLINOIS:		
Chicago and vicinity (revision)	1:62500	5 and 10
INDIANA:		
Boonville	1:62500	20
Petersboro	1:62500	20

Topographic sheets completed in office during 1899–1900—Continued.

State and sheet.	Scale.	Contour interval.
Iowa:		*Feet.*
West Union	1:125000	20
Maine:		
Bucksport	1:62500	20
Orland	1:62500	20
Maryland:		
Havre de Grace	1:62500	20
Cecilton	1:62500	20
Betterton	1:62500	20
Chesterton	1:62500	20
Maryland–West Virginia:		
Oakland	1:62500	20
Hancock	1:62500	20
Minnesota:		
Mesabi Special	1:62500	20
Anoka	1:62500	20
White Bear	1:62500	20
Tower Special	1:15840	10
Ely Special	1:15840	10
Missouri:		
Union	1:125000	50
Montana:		
Elkhorn Special	1:31250	50
Marysville Special	1:31250	50
North Carolina:		
Asheville (resurvey)	1:125000	100
Nebraska:		
North Platte	1:125000	50
Gothenburg (¾)	1:125000	50
New York:		
Palmyra	1:62500	20
Clyde	1:62500	20
Weedsport	1:62500	20
Geneva	1:62500	20
Phelps	1:62500	20
Ovid	1:62500	20
Genoa	1:62500	20
Waverly	1:62500	20

Topographic sheets completed in office during 1899–1900—Continued

State and sheet.	Scale.	Contour interval.
NEW YORK—Continued.		*Feet.*
Morrisville	1:62500	20
Broadalbin	1:62500	20
Saratoga	1:62500	20
Millbrook	1:62500	20
Schunemunk	1:62500	20
Raquette Lake	1:62500	20
OHIO:		
East Columbus	1:62500	20
West Columbus	1:62500	20
Toledo	1:62500	20
Maumee Bay	1:62500	20
Oak Harbor	1:62500	20
OREGON:		
Baker City	1:125000	100
PENNSYLVANIA:		
Erie	1:62500	20
Girard	1:62500	20
Uniontown	1:62500	20
Masontown	1:62500	20
Elkland	1:62500	20
Gaines	1:62500	20
SOUTH DAKOTA:		
Hermosa (resurvey)	1:125000	100
Deadwood (resurvey)	1:125000	100
TENNESSEE:		
Columbia	1:125000	50
TEXAS:		
Bastrop (resurvey)	1:125000	25
Llano (resurvey)	1:125000	25
UTAH:		
Bingham Special	1:20000	50
WASHINGTON:		
Ellensburg	1:125000	100
Glacier Peak	1:125000	100
Stillaguamish	1:125000	100
WEST VIRGINIA:		
Nicholas (resurvey)	1:125000	100

Topographic sheets completed in office during 1899–1900—Continued.

State and sheet.	Scale.	Contour interval.
WISCONSIN:		*Feet.*
Milwaukee and vicinity (revision)	1:62500	20
Wausau	1:125000	20
Marathon	1:125000	20
Dells	1:62500	20
Portage	1:62500	20
Poynette	1:62500	20
WYOMING:		
Dayton (resurvey)	1:125000	50
Newcastle	1:125000	50
Cloud Peak	1:125000	50
Mount Leidy	1:125000	50
Teton	1:125000	50
INDIAN TERRITORY:		
Wyandotte	1:125000	50
Siloam	1:125000	50
Sallisaw	1:125000	50
Purcell	1:125000	50
Chickasha	1:125000	50
Pauls Valley	1:125000	50
INDIAN TERRITORY-TEXAS:		
Montague	1:125000	50
Gainesville	1:125000	50
Bonham	1:125000	50
Paris	1:125000	50
Clarksville	1:125000	50
Shawneetown	1:125000	50

In addition to the above, two large sheets covering the work in Alaska were drawn and photolithographed.

The office computation of the triangulation and primary traverse was under the charge of Mr. S. S. Gannett, as heretofore. The results of this work are summarized and published in the Appendix, as is also a list of the bench marks established by spirit leveling.

The topographic records and the purchase and repair of instruments remained in charge of Mr. S. A. Aplin.

The cataloguing and systematic arrangement of the topographic records was continued during the year, with the result that all the old material was properly catalogued and filed. During this period about 1,875 books, including triangulation, topographic, and level records, and 58 plane-table sheets were catalogued. About 800 of this number represent level and vertical angle records of the survey of Indian Territory. The arrangement of envelopes containing miscellaneous matter pertaining to each atlas sheet was continued and has practically been completed. The cataloguing of notebooks, etc., pertaining to the field season of 1899 has been in progress since the 1st of January. About 1,000 pieces have been catalogued, and there remain about 300 pieces yet to be entered.

Repairs to the instruments were had, as formerly, through contract, Mr. G. N. Saegmüller, of Washington, and Messrs. W. & L. E. Gurley, of Troy, New York, making the greater part of them. It became necessary this year to repair extensively the entire stock of telescopic alidades, the repairs consisting principally of adjusting all bearings and providing new arcs and verniers. The stock of instruments was increased during the year by the purchase of one Fauth 8-inch micrometer theodolite for general use, one Fauth transit fitted for astronomic work, and one telescopic alidade of special design for the use of the Alaskan parties.

Efficient assistance was rendered during the year by Mr. Powell P. Withers in matters pertaining to the instruments, and by Mr. Joseph W. Kreuttner in connection with the records, until the 1st of January, when his services were diverted elsewhere, and the duties he had performed were assumed by Mr. Withers.

Division of Geography and Forestry

Mr. Henry Gannett, geographer of the Survey, continued in charge of the revision of the large map of the United States, and also gave consideration to such geographic matters as were referred to him.

GEOGRAPHY.

Within the year a third edition of the Dictionary of Altitudes, by Mr. Gannett, work upon which was carried on during the previous year, was finished and published as Bulletin No. 160. The Gazetteer of Utah, similarly prepared by Mr. Gannett during the previous year, was published as Bulletin No. 166; also a compilation of Altitudes in Alaska, as Bulletin No. 169; also a second edition of Bulletin No. 13 (published in 1885 and now out of stock), Boundaries of the United States and of the States and Territories, with an Outline of the History of all Important Changes, as Bulletin No. 171; also Topographic Folio No. 2, containing ten plates and text illustrating and describing physiographic types additional to those described in Folio No. 1; also a compilation of the Slopes of the Rivers of the United States, which will be published as Topographic Folio No. 4. A Physical Geography of the Texas Region, accompanied by an excellent compiled map of that region, was prepared by Mr. R. T. Hill, under this division, and is now in press as Topographic Folio No. 3. The preparation of a Dictionary of Place Names in the United States, with special reference to their origin, was commenced and is being carried forward.

FORESTRY.

The Lewis and Clarke Reserve, of Montana, was examined by Mr. H. B. Ayres, who devoted the entire field season to its examination, completing it.

The work of examining the Mount Rainier Forest Reserve, in Washington, which was commenced in the previous year, was completed by Mr. F. G. Plummer, with assistants. Mr. Plummer has not only examined the forest reserve, but has made a reconnaissance map of the area.

The examination of the Olympic Forest Reserve, which was commenced in the previous year, was nearly completed by Messrs. Arthur Dodwell and Theodore F. Rixon. Sixty-one townships were examined during the season, making, with the ten examined the previous season, a total of seventy-one. These embrace about three-fourths of the area of the reserve.

Examination of the Cascade Range Forest Reserve, in Oregon, was commenced by Mr. J. B. Leiberg. During the season he examined the southern portion of the reserve, including adjacent regions on the east, west, and south, the area examined being comprised in the Ashland and Klamath quadrangles, together with a few hundred square miles in the central portion of the Cascades, north of these quadrangles. The Ashland Forest Reserve was also included in the area examined.

Work was commenced in the series of reserves and parks in the Sierra Nevada, California. Mr. George B. Sudworth examined the Big Trees, Jackson, Placerville, and Pyramid Peak quadrangles. Mr. C. H. Fitch examined the Sonora and Yosemite quadrangles.

The reconnaissance of the standing timber of Oregon, commenced in the previous year by Mr. A. J. Johnson, was continued throughout the greater part of the year and is now completed, except a portion of the Blue Mountains, in northeastern Oregon, and the forest reserves of the Cascade Range.

During the year Mr. H. B. Ayres, in addition to his work on the Lewis and Clarke Reserve, completed the collection of data, cruisings, etc., relating to the pine region of Minnesota and the upper peninsula of Michigan.

During the winter and spring reports have been prepared on the results of the work done, with the exception of the reconnaissance of the State of Oregon, and these reports are presented in Part V of this Annual Report. The statistics of standing timber in Oregon, together with a general land-classification map of the State, it is deemed best to defer for a year, until the work is completed and digested.

During the year many land-classification sheets have been completed in addition to those included in the examination of the forest reserves. These have been prepared in part by the topographers, who have, as a rule, done most admirable work, far more than was expected of them in this direction. Their work has been supplemented by estimates of standing timber, its distribution and density, so that the maps, many of which are presented in Part V of this report, will be fairly complete as far as regards the classification of lands and the stand of timber.

During the progress of the surveys of Indian Territory the woodlands were mapped with great accuracy, and notes were made by the surveyors concerning the character and quality of the timber. A map of the Territory on a small scale, in contours, showing the woodland, has been prepared and issued, with an abstract of the surveyors' notes, as a reconnaissance of the region. It is intended to supplement this, as soon as means are provided, by an examination of the forests by experts.

The information concerning the forest reserves and other timbered regions of the West has been utilized largely by the Department in creating reserves, modifying their boundaries, and administering them.

PUBLICATION BRANCH.

Division of Illustrations.

The Division of Illustrations remained in charge of Mr. John L. Ridgway, who was assisted by Messrs. H. Chadwick Hunter, H. Hobart Nichols, F. W. von Dachenhausen, D. W. Cronin, John H. Pellen, Miss Frances Wieser, and Miss Mary M. Mitchell. On account of an extended leave of absence without pay granted Mr. H. Hobart Nichols, his brother, Mr. Spencer B. Nichols, was employed at piecework, and rendered highly satisfactory service.

Improvements were made in many directions, largely through systemization of the work, and the results obtained in the preparation of illustrations, notwithstanding the greatly increased number, were no less satisfactory than in previous years.

During the year 2,459 drawings were prepared. They may be classified as follows:

Geologic and topographic landscapes	78
Geologic and topographic maps	152
Geologic diagrams and sections	520
Paleontologic drawings	1,004
Photographs prepared for reproduction	284
Miscellaneous drawings	421
Total	2,459

Drawings, including many of the above, were transmitted to accompany the following reports: Twentieth Annual Report, Parts I–VII; Monograph XXXIX; Bulletins Nos. 163–167, 170, 171; Water-Supply and Irrigation Papers Nos. 31–34; Topographic Folios Nos. 2 and 3.

The following processes were adopted in the reproduction of the drawings transmitted during the year:

By chromolithography	101
By photolithography	5
By engraving on stone	12
By photoengraving	445
By half tone	801
By photogelatin	42
By wax engraving	28
Electrotypes	23

Proofs to the number of 2,244 were received and criticised, and an examination was made at the Government Printing Office of the full editions of 252 printed lithographic plates.

Photographic Laboratory.

The Photographic Laboratory continued to be operated in conjunction with the Division of Illustrations until November 23, 1899, Mr. John L. Ridgway being in charge, assisted by the following force: Messrs. J. K. Hillers, chief photographer; C. C. Jones, John Erbach, Charles A. Ross, Nelson H. Kent, Edgar M. Bane, and Ernest A. Schuster, jr.

On the date mentioned the laboratory was placed in charge of a committee consisting of Messrs. C. Willard Hayes, Whitman Cross, and N. H. Darton, for the purpose of ascertaining the possibilities of improving the quality of the work. After a careful investigation by the committee, and on its recommendation, the laboratory was, on January 1, 1900, placed in charge of Mr. S. J. Kübel, chief of the Division of Engraving and Printing.

In April, Mr. Hillers having been transferred to the per diem roll, Mr. Norman W. Carkhuff was appointed chief photographer, and the laboratory was placed in his charge on May 1, 1900.

Following is a tabular statement of the work done in the laboratory during the year:

Work of the photographic laboratory for the year 1899–1900.

Month.	Negatives made.			Prints made.	Slides made.	Slides labeled.	Slides bound.	Prints mounted.	Prints bleached.	Transparencies made.
	Wet.	Dry.	Total.							
1899.										
July	151	102	253	814	2	......	......	......	......	......
August	63	300	363	878	......	......	......	......	......	......
September	39	84	123	566	......	......	......	......	......	......
October	43	71	114	758	15	78	......	......	......	......
November	29	189	218	647	36	......	......	48	......	......
December	83	310	393	1,168	9	......	......	......	......	......

Work of the photographic laboratory for the year 1899–1900—Cont'd.

Month.	Negatives made.			Prints made.	Slides made.	Slides labeled.	Slides bound.	Prints mounted.	Prints bleached.	Transparencies made.
	Wet.	Dry.	Total.							
1900.										
January	227	152	379	1,179	21	53	.....	63	2	......
February	120	71	191	939	82	.....	.....	53	......	......
March	184	60	244	1,412	100	43	.....	175	......	8
April.........	173	36	209	2,505	74	7	.....	73	......	8
May	131	54	185	1,440	2	.....	4	159	6	......
June.........	153	49	202	1,631	16	.....	17	80	......	......
Total...	1,396	1,478	2,874	13,937	357	181	21	651	8	16

Negatives and prints made during 1899–1900, classified by size.

Size.	Negatives.	Prints.
28 by 34 inches	186	724
22 by 28 inches	95	407
20 by 24 inches	408	2,528
14 by 17 inches	248	853
11 by 14 inches	296	1,224
8 by 10 inches	212	1,723
6½ by 8½ inches	232	1,307
5 by 7 inches	891	3,521
4 by 5 inches	306	1,650
Total	2,874	13,937

Editorial Division.

TEXTUAL PUBLICATIONS.

Mr. Philip C. Warman remained in charge of this section. He was assisted throughout the year by Messrs. George M. Wood and L. F. Schmeckebier, and by Miss M. G. Wilmarth until June 1, when she was transferred to the Division of Hydrography.

As during previous years, the work progressed in a highly satisfactory manner, and at the close of the fiscal year was well in hand. Following are lists of the manuscripts prepared for the printer, proofs read and corrected, and indexes made during the year:

Manuscripts edited during the year 1899-1900.

Publication.	Pages (usually type-written).
Twentieth Annual Report (in part)	7,901
Twenty-first Annual Report (in part)	2,368
Monograph XXXIX	481
Monograph XL	383
Bulletin No. 162	421
Bulletin No. 163	258
Bulletin No. 164	141
Bulletin No. 165	423
Bulletin No. 166	77
Bulletin No. 167	187
Bulletin No. 168	353
Bulletin No. 169	17
Bulletin No. 170	170
Bulletin No. 171	154
Bulletin No. 172	271
Bulletin No. 173	1,019
Bulletin No. 174	109
Water-Supply Paper No. 31	142
Water-Supply Paper No. 32	80
Water-Supply Paper No. 33	200
Water-Supply Paper No. 34	53
Water-Supply Paper No. 35	323
Water-Supply Paper No. 36	180
Water-Supply Paper No. 37	160
Water-Supply Paper No. 38	142
Water-Supply Paper No. 39	142
Geologic Folio No. 54	117
Geologic Folio No. 55	76
Geologic Folio No. 56	95
Geologic Folio No. 57	209
Geologic Folio No. 58	50
Geologic Folio No. 59	85
Geologic Folio No. 61	80
Geologic Folio No. 62	92
Geologic Folio No. 63	90
Geologic Folio No. 65	114
Topographic Folio No. 3	142
Topographic Folio No. 4	251
Cape Nome Report (Senate Doc. 236)	104
List of Publications of United States Geological Survey	94
Circulars for Topographic Branch	80
Total number of manuscript pages edited	17,834

Proof sheets read and corrected during the year 1899–1900.

Publication.	Final printed pages.
Nineteenth Annual Report (in part)	353
Twentieth Annual Report (in part)	4,997
Twenty-first Annual Report (in part)	48
Monograph XXXIX	275
Bulletin No. 157	172
Bulletin No. 158	183
Bulletin No. 159	151
Bulletin No. 162	175
Bulletin No. 163	130
Bulletin No. 164	112
Bulletin No. 165	225
Bulletin No. 166	55
Bulletin No. 167	178
Bulletin No. 168	320
Bulletin No. 169	25
Bulletin No. 170	79
Bulletin No. 171	149
Water-Supply Paper No. 30	97
Water-Supply Paper No. 31	97
Water-Supply Paper No. 32	48
Water-Supply Paper No. 33	98
Water-Supply Paper No. 34	34
Water-Supply Paper No. 35	100
Water-Supply Paper No. 36	98
Water-Supply Paper No. 37	100
Water-Supply Paper No. 38	97
Geologic Folio No. 52	7
Geologic Folio No. 53	6
Geologic Folio No. 54	12
Geologic Folio No. 55	8
Geologic Folio No. 56	10
Geologic Folio No. 57	22
Geologic Folio No. 58	7
Geologic Folio No. 59	8
Geologic Folio No. 62	13
Topographic Folio No. 2	11
Topographic Folio No. 3	17
Instructions for Topographic Branch	11
Cape Nome Report (Senate Doc. 236)	56
List of Publications	93
Irrigation on Gila River, Arizona (Senate Doc. 152)	19
Total number of printed pages	8,696

Indexes prepared during the year 1899–1900.

Publication.	Pages indexed.
Twentieth Annual Report, Part I	530
Twentieth Annual Report, Part II	930
Twentieth Annual Report, Part III	581
Twentieth Annual Report, Part IV	637
Twentieth Annual Report, Part V	478
Twentieth Annual Report, Part VII	494
Monograph XXXIX	256
Bulletin No. 157	156
Bulletin No. 158	167
Bulletin No. 159	102
Bulletin No. 164	95
Bulletin No. 165	203
Bulletin No. 167	160
Bulletin No. 170	65
Bulletin No. 171	137
Water-Supply Paper No. 29	82
Water-Supply Paper No. 30	94
Water-Supply Paper No. 31	93
Water-Supply Paper No. 32	46
Water-Supply Paper No. 33	95
Water-Supply Paper No. 34	31
Irrigation on Gila River, Arizona (Senate Doc. 152)	18
Total number of pages indexed	5,450

As much time as could be spared from the regular work was devoted to the preparation of a general index of all Survey publications to date. It is hoped that this, which is in the nature of a revision and enlargement of Bulletin No. 100, can be made ready for the printer the coming autumn.

On February 17, 1899, Mr. Warman was appointed chairman of a Committee on Geologic Formation Names, the other members being Messrs. G. W. Stose and F. B. Weeks. This committee has investigated and made recommendations concerning a number of cases of conflicting names of geologic formations.

GEOLOGIC MAPS.

In March the scope of this section was enlarged so that it should include all maps except topographic atlas sheets published by the Division of Engraving and Printing. This places in its charge supervision of land-classification maps which show the distribution of timber and agricultural land. General drafting for the office also forms a part of the work of the section.

Mr. George W. Stose continued in charge of the section, and was assisted by Messrs. O. A. Ljungstedt and H. S. Selden. Geologic sections for exact reproduction by copperplate engraving or photolithography were drawn by Mr. Ljungstedt. The reading of proof and general drafting for the office were done chiefly by Mr. Selden. Messrs. Bailey Willis and P. C. Warman continued to edit the folio texts. Mr. Stose supervised all work done in the section, edited the maps, sections, and illustrations transmitted by the authors, and planned the color patterns for the lithographic maps. When both assistants were occupied with extra drafting, he read proof and attended to other details of the work. During the year Mr. Stose served on three committees which are closely related to the editing work. In August and September, 1899, he joined Mr. Waldemar Lindgren in Montana, and assisted in a reconnaissance survey in the Bitterroot Mountains and across Idaho.

Nine geologic folios were completed during the year, Nos. 52 to 59, inclusive, and No. 62. The list of published folios is as follows:

Geologic folios published.

No.	Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Price in cents.
1	Livingston	Montana......	110°-111°	45°-46°	3,354	25
2	Ringgold.......	Georgia .... Tennessee	85°-85°30′	34°30′-35°	980	25
3	Placerville	California.....	120°30′-121°	38°30′-39°	932	25
4	Kingston	Tennessee	84°30′-85°	35°30′-36°	969	25
5	Sacramento	California.....	121°-121°30′	38°30′-39°	932	25
6	Chattanooga ...	Tennessee	85°-85°30′	35°-35°30′	975	25
7	Pikes Peak (including Cripple Creek map).	Colorado......	105°-105°30′	38°30′-39°	932	25
8	Sewanee........	Tennessee	85°30′-86°	35°-35°30	975	25
9	Anthracite-Crested Butte.	Colorado......	106°45′-107°15′	38°45′-39°	465	50
10	Harpers Ferry..	Virginia ...... West Virginia. Maryland.....	77°30′-78°	39°-39°30′	925	25

Geologic folios published—Continued.

No.	Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Price in cents.
11	Jackson	California	120°30′-121°	38°-38°30′	938	25
12	Estillville	Virginia Kentucky Tennessee	82°30′-83°	36°30′-37°	957	25
13	Fredericksburg	Maryland Virginia	77°-77°30′	38°-38°30′	938	25
14	Staunton	....do West Virginia	79°-79°30′	38°-38°30′	938	25
15	Lassen Peak	California	121°-122°	40°-41°	3,634	25
16	Knoxville	Tennessee North Carolina	83°30′-84°	35°30′-36°	969	25
17	Marysville	California	121°30′-122°	39°-39°30′	925	25
18	Smartsville	.....do	121°-121°30′	39°-39°30′	925	25
19	Stevenson	Alabama Georgia Tennessee	85°30′-86°	34°30′-35°	980	25
20	Cleveland	.....do	84°30′-85°	35°-35°30′	975	25
21	Pikeville	.....do	85°-85°30′	35°30′-36°	969	25
22	McMinnville	.....do	85°30′-86°	35°30′-36°	969	25
23	Nomini	Maryland Virginia	76°30′-77°	38°-38°30′	938	25
24	Three Forks	Montana	111°-112°	45°-46°	3,354	50
25	Loudon	Tennessee	84°-84°30′	35°30′-36°	969	25
26	Pocahontas	Virginia West Virginia	81°-81°30′	37°-37°30′	950	25
27	Morristown	Tennessee	83°-83°30′	36°-36°30′	963	25
28	Piedmont	Maryland West Virginia	79°-79°30′	39°-39°30′	925	25
29	Nevada City Special:					
	Nevada City	California	121°00′25″-121°03′45″	39°13′50″-39°17′16″	11.65	50
	Grass Valley		121°01′35″-121°05′04″	39°10′22″-39°13′50″	12.09	
	Banner Hill		120°57′05″-121°00′25″	39°13′50″-39°17′16″	11.65	
30	Yellowstone National Park:					
	Gallatin Canyon Shoshone Lake	Wyoming	110°-111°	44°-45°	3,412	75
31	Pyramid Peak	California	120°-120°30′	38°30′-39°	932	25
32	Franklin	Virginia West Virginia	79°-79°30′	38°30′-39°	932	25
33	Briceville	Tennessee	84°-84°30′	36°-36°30′	963	25
34	Buckhannon	West Virginia	80°-80°30′	38°30′-39°	932	25
35	Gadsden	Alabama	86°-86°30′	34°-34°30′	986	25
36	Pueblo	Colorado	104°30′-105°	38°-38°30′	938	50
37	Downieville	California	120°30′-121°	39°30′-40°	919	25
38	Butte Special	Montana	112°29′30″-112°36′42″	45°59′28″-46°02′54″	22.8	50
39	Truckee	California	120°-120°30′	39°-39°30′	925	25
40	Wartburg	Tennessee	84°30′-85°	36°-36°30′	963	25
41	Sonora	California	120°-120°30′	37°30′-38°	944	25
42	Nueces	Texas	100°-100°30′	29°30′-30°	1,035	25
43	Bidwell Bar	California	121°-121°30′	39°30′-40°	919	25

Geologic folios published—Continued.

No.	Name of folio.	State.	Limiting meridians.	Limiting parallels.	Area in square miles.	Price in cents.
44	Tazewell	Virginia West Virginia.	81°30′-82°	37°-37°30′	950	25
45	Boise	Idaho	116°-116°30′	43°30′-44°	864	25
46	Richmond	Kentucky	84°-84°30′	37°30′-38°	944	25
47	London	do	84°-84°30′	37°-37°30′	950	25
48	Tenmile District Special.	Colorado	106°08′-106°16′08″	39°22′57″-39°30′25″	62.2	25
49	Roseburg	Oregon	123°-123°30′	43°-43°30′	871	25
50	Holyoke	Massachusetts Connecticut	72°30′-73°	42°-42°30′	885	50
51	Big Trees	California	120°-120°30′	38°-38°30′	938	25
52	Absaroka:					
	Crandall	Wyoming	109°30′-110°	44°30′-45°	849	25
	Ishawooa		109°30′-110°	44°-44°30′	857	
53	Standingstone	Tennessee	85°-85°30′	36°-36°30′	963	25
54	Tacoma	Washington	122°-122°30′	47°-47°30′	812	25
55	Fort Benton	Montana	110°-111°	47°-48°	3,234	25
56	Little Belt Mountains.	do	110°-111°	46°-47°	3,295	25
57	Telluride	Colorado	107°45′-108°	37°45′-38°	236	25
58	Elmoro	do	104°-104°30′	37°-37°30′	950	25
59	Bristol	Virginia Tennessee	82°-82°30′	36°30′-37°	957	25
62	Menominee Special (a map of the Menominee iron district).	Michigan	87°44′-88°09′	45°44′-45°55′	254	25

Eleven other folios are in various stages of engraving. They are:

Charleston, West Virginia.
Colfax, California.
Huntington, West Virginia-Ohio.
La Plata, Colorado.
Monterey, Virginia-West Virginia.
Mother Lode District, California.
Spanish Peaks, Colorado.
Tintic Special, Utah.
Uvalde, Texas.
Walsenburg, Colorado.
Washington, District of Columbia.

Fifteen folios were received during the year from authors for publication, as follows:

Atoka, Indian Territory.
Austin, Texas.
Cartersville, Georgia.
Coalgate, Indian Territory.
Coos Bay, Oregon.
Dalton, Georgia.
Danville, Illinois.
Housatonic, Massachusetts-Connecticut-New York.
Marietta, Georgia.
Maynardville, Tennessee.
Menominee Special, Michigan.
New York City, New York.
Raleigh, West Virginia.
San Luis, California.
Tallapoosa, Georgia-Alabama.

Only one of this last group, the Menominee Special folio, was taken up. On account of the unusual importance of its economic work and its conclusions, this folio was advanced and published at once. It describes the geology of the Menominee iron region. The origin of the deposits is discussed and directions for future prospecting are given.

The folios published during the year include reports on the following mineral deposits: Coal in Washington, Tennessee, Montana, and Colorado; gold and silver in Montana and Colorado; copper and sapphires in Montana; and iron in Michigan.

The Little Belt Mountains and Fort Benton folios embrace a large area, as they are on the 4-mile scale, and together they present a very interesting geologic region. The Telluride folio is on a larger scale and the geology is presented in great detail. The description is very complete, including a discussion of the mining interests, and is illustrated with beautiful photographs. The Mother Lode District and Tintic Special folios treat of these two important mining centers in detail. On account of the number of special maps in these two folios they could not be finished within the fiscal year, but are now nearing completion.

Two land-classification maps have been published, the Tacoma and Seattle sheets. These maps show by colors the wooded and cultivated areas, and indicate the timber that is valuable.

TOPOGRAPHIC MAPS.

Although the editing of topographic maps and the engraving and printing of the same are now under one supervision, it is considered advantageous to render independent reports.

Mr. Marcus Baker having taken an extended leave of absence for duty in connection with the Venezuela Boundary Commission, editorial work on topographic maps was placed in charge of Mr. S. J. Kübel on July 29, 1899. He was assisted by Messrs. James McCormick, H. W. Elmore, and William Stranahan. In order to utilize the services of Mr. McCormick in the field he was detailed as topographer in eastern and central New York from August to November inclusive, and Mr. Stranahan was for the same reason sent to the field during July and August.

The duties of this section include the custody of the manuscript of the published and unpublished maps of the Survey, the examination of new manuscript before and in preparation for engraving, and the proof reading of engraved maps before publication. They also include the custody of the data for the correction of published maps, the preparation of the same for engraving, and the reading of proof after engraving.

The manuscript maps designed for illustrating the various publications in book form—annual reports, monographs, bulletins, folios, etc.—were examined and revised, with special reference to their nomenclature, to the number of 176, as follows:

Twentieth Annual Report, Part III	15
Twentieth Annual Report, Part IV	55
Topographic Folio No. 3	28
Topographic Folio No. 4	[a]5
Water-Supply Paper No. 34	5
Land Classification of Washington	1
Bulletin No. 170	2
Bulletin No. 171	65
Total	176

The progress in the publication of maps on the scale of 1;125,000 by the reduction and combination of those originally published on the scale of 1:62,500 is shown in the following table:

Progress in publication of maps on scale 1:125000 by reduction and combination.

Name of sheet; scale 1:125000.	Name of sheet; scale 1:62500, reduced and combined.	Stage of progress in publication.
Holyoke, Mass.-Conn.	Chesterfield, Granville, Northampton, Springfield.	Published previous to July, 1898.
Nomini, Md.-Va	Leonardtown, Montross, Piney Point, Wicomico.	Do.
Housatonic, Mass.-Conn.-N.Y.	Becket, Pittsfield, Sandisfield, Sheffield.	Published during fiscal year 1898-99.
Niagara, N.Y	Lockport, Niagara Falls, Olcott, Tonawanda, Wilson.	Do.

[a] And profiles.

Progress in publication of maps on scale 1: 125000 by reduction and combination—Continued.

Name of sheet: scale 1: 125000.	Name of sheet: scale 1: 62500, reduced and combined.	Stage of progress in publication.
Patuxent, Md.-D. C	Brandywine, East Washington, Owensville, Prince Frederick.	Published during fiscal year 1898-99.
Raritan, N. J	Hackettstown, High Bridge, Lake Hopatcong, Somerville.	Published during fiscal year 1899-1900.
Passaic, N. J.-N. Y	Morristown, Paterson, Plainfield, Staten Island.	Do.
San Luis, Cal	Arroyo Grande, Cayucos, Port Harford, San Luis Obispo.	Do.
Camden, N. J.-Pa.-Del.	Chester, Glassboro, Philadelphia, Salem.	In process of engraving.
Rancocas, N. J	Hammonton, Mount Holly, Mullica, Pemberton.	Do.
Taconic, N. Y.-Mass.-Vt.	Bennington, Greylock, Berlin, Hoosick.	Do.

On July 1, 1899, there were on hand for engraving 112 unpublished atlas sheets and other maps. One of these, the Snoqualmie, Washington, has since been withdrawn for further field work. Another, the Dover, Maryland-Delaware, has been completed as to engraving, but the sheet has been withheld from publication. The Tonawanda, New York, published as part of the Niagara Falls and vicinity in June, 1894, has now been published separately. Making the deductions and addition, there were on hand at the beginning of the year, for publication, 111 sheets. During the year, 86 new sheets were received, making a total of 197. These 197 sheets are listed below in four groups:

Group 1 comprises 72 sheets which were published during the year or were in press at the close of the year.

Group 2 comprises 40 sheets which were in process of engraving at the close of the year.

Group 3 comprises 25 sheets which have been edited and approved for engraving.

Group 4 comprises 60 sheets which at the close of the year had not yet been approved for engraving.

Analysis of these figures shows that at the end of the year there were on hand 125 atlas sheets and special maps unpublished, but that the engraving of 40 of these was in various stages of progress.

Topographic atlas sheets and other maps engraved and printed (or in press) during the fiscal year 1899–1900.

Quadrangle and State.	Position of SE. corner.				Contour interval.	Scale.
	Latitude.		Longitude.			
	°	′	°	′	*Feet.*	
Alexandria, South Dakota	43	30	97	30	20	1:125000
Anamosa, Iowa	42	00	91	00	20	1:125000
Anniston, Alabama (resurvey)	33	30	85	30	50	1:125000
Atoka, Indian Territory	34	00	96	00	50	1:125000
Betterton, Maryland	39	15	76	00	20	1:62500
Brookwood, Alabama	33	00	87	00	50	1:125000
Browns Creek, Nebraska	41	30	102	30	20	1:125000
Calumet, Illinois-Indiana (resurvey)	41	30	87	30	10	1:62500
Canada Lake, New York	43	30	74	30	20	1:62500
Canajoharie, New York	42	45	74	30	20	1:62500
Canton, South Dakota-Iowa	43	00	96	30	20	1:125000
Cazenovia, New York	42	45	75	45	20	1:62500
Cecilton, Maryland	39	15	75	45	20	1:62500
Chappell, Nebraska	41	00	102	00	20	1:125000
Cherry Creek, New York	42	15	79	00	20	1:62500
Chicago, Illinois (resurvey)	41	45	87	30	5	1:62500
Clinton, Iowa-Illinois	41	30	90	00	20	1:125000
Desplaines, Illinois (resurvey)	41	30	87	45	10	1:62500
Dunkirk, New York	42	15	79	15	20	1:62500
East Cincinnati, Ohio-Kentucky	39	00	84	15	20	1:62500
Engineer Mountain, Colorado	37	30	107	45	100	1:62500
Evanston, Illinois	42	00	87	30	10	1:62500
Fernando, California	34	15	118	15	50	1:62500
Flintstone, Maryland-West Virginia-Pennsylvania	39	30	78	30	20	1:62500
Fort Payne, Alabama-Georgia (resurvey)	34	00	85	30	50	1:125000
Franklin Furnace, New Jersey	......	......	......	......	10	1:14400
Fulton, New York	43	15	76	15	20	1:62500

Topographic atlas sheets and other maps engraved and printed (or in press) during the fiscal year 1899–1900—Continued.

Quadrangle and State.	Position of SE. corner.				Contour interval.	Scale.
	Latitude.		Longitude.			
	°	'	°	'	*Feet.*	
Grantsville, Maryland-Pennsylvania	39	30	79	00	20	1:62500
Helena Special, Montana	46	30	111	52	50	1:62500
Highwood, Illinois	42	00	87	45	10	1:62500
Indian Lake, New York	43	30	74	15	20	1:62500
Ironton, Ohio-Kentucky	38	30	82	30	20	1:62500
Lakin, Kansas	37	30	101	00	20	1:125000
Little Falls, New York	43	00	74	45	20	1:62500
Loup, Nebraska	41	00	98	30	20	1:125000
Macedon, New York	43	00	77	15	20	1:62500
Menominee Special, Michigan					20	1:62500
Mitchell, South Dakota	43	30	98	00	20	1:125000
Ogalalla, Nebraska	41	00	101	30	20	1:125000
Oswego, New York	43	15	76	30	20	1:62500
Oswego Special, New York	43	15	76	20	20	1:62500
Passaic, New Jersey-New York	40	30	74	00	20	1:125000
Pawpaw, Maryland-West Virginia-Pennsylvania	39	30	78	15	20	1:62500
Peterboro, New Hampshire	42	45	71	45	20	1:62500
Raritan, New Jersey	40	30	74	30	20	1:125000
Remsen, New York	43	15	75	00	20	1:62500
Rico Special, Colorado					50	1:23600
Riverside, Illinois (resurvey)	41	45	87	45	10	1:62500
St. Paul, Nebraska	41	00	98	00	20	1:125000
Salamanca, New York	42	00	78	30	20	1:62500
Sallisaw, Indian Territory	35	00	94	30	20	1:125000
San Luis, California	35	00	120	30	100	1:125000
Sawtooth, Idaho-Oregon	43	30	114	30	100	1:125000
Schoharie, New York	42	30	74	15	20	1:62500
Schuylerville, New York	43	00	73	30	20	1:62500
Seattle Forestry Map, Washington	47	30	122	00	50	1:125000
Sidney, Nebraska	41	00	102	30	20	1:125000
Silver Creek, New York	42	30	79	00	20	1:62500
Silver Peak, Nevada-California	37	30	117	30	100	1:125000
Spearfish, South Dakota	44	15	103	45	50	1:62500

Topographic atlas sheets and other maps engraved and printed (or in press) during the fiscal year 1899–1900—Continued.

Quadrangle and State.	Position of SE. corner.				Contour interval.	Scale.
	Latitude.		Longitude.			
	°	′	°	′	*Feet.*	
Syracuse, Kansas	37	30	101	30	20	1:125000
Tacoma Forestry Map, Washington	112	00	47	00	50	1:125000
Texas, Topographic Map of					250	1 in. = 25 m.
Tonawanda, New York	43	00	78	45	20	1:62500
Tully, New York	42	45	76	00	20	1:62500
Vineland, New Jersey	39	00	75	00	20	1:125000
West Cincinnati, Ohio-Kentucky	39	00	84	30	20	1:62500
Westfield, New York	42	15	79	30	20	1:62500
Whistle Creek, Nebraska	42	00	103	30	20	1:125000
Whitefield, New Hampshire-Vermont	44	15	71	30	20	1:62500
Wilmurt, New York	43	15	74	45	20	1:62500
Winding Stair, Indian Territory	34	30	94	30	50	1:125000

Topographic atlas sheets and other maps in process of engraving.

Accident, Maryland-Pennsylvania-West Virginia.
Baldwinsville, New York.
Bucksport, Maine.
Camden, New Jersey-Pennsylvania-Delaware.
Canadian, Indian Territory.
Deadwood, South Dakota (resurvey).
Dryden, New York.
East Columbus, Ohio.
Elkland, Pennsylvania.
Elsinore, California.
Erie, Pennsylvania.
Fairview, Pennsylvania.
Flatonia, Texas.
Gaines, Pennsylvania.
Girard, Pennsylvania.
Harney Peak, South Dakota (resurvey).
Havre de Grace, Maryland-Pennsylvania.
Lancaster, Wisconsin-Iowa-Illinois.
Maquoketa, Iowa-Illinois.
Masontown, Pennsylvania.
Maumee Bay, Ohio-Michigan.
Oak Harbor, Ohio.
Oakland, Maryland-West Virginia.
Okmulgee, Indian Territory.
Old Forge, New York.
Orland, Maine.
Paxton, Nebraska.
Pingree, North Dakota.
Rancocas, New Jersey.
Riverside, California.
St. Croix Dalles, Wisconsin-Minnesota.
Sansbois, Indian Territory.
San Jacinto, California.
Taconic, New York-Massachusetts-Vermont.
Toledo, Ohio-Michigan.
Toleston, Indiana.
Tujunga, California.
Uniontown, Pennsylvania.
West Columbus, Ohio.
Wewoka, Indian Territory.

Manuscript topographic atlas sheets examined and approved for engraving.

Addington, Indian Territory.
Antlers, Indian Territory.
Ardmore, Indian Territory.
Bald Mountain, Wyoming.
Chelan, Washington.[2]
Claremore, Indian Territory.
Cloud Peak, Wyoming.
Dayton, Wyoming (resurvey).
Denison, Texas–Indian Territory.
Ellensburg, Washington.
Glacier Peak, Washington.
Hermosa, South Dakota (resurvey).
Methow, Washington.
Newcastle, South Dakota.
Nowata, Indian Territory.
Nuyaka, Indian Territory.[1]
Muscogee, Indian Territory.
Pryor, Indian Territory.
San Luis Rey, California.
Spokane, Washington.
Stilaguamish, Washington.
Stonewall, Indian Territory.
Tahlequah, Indian Territory.
Tishomingo, Indian Territory.
Vinita, Indian Territory.

New topographic atlas sheets awaiting editorial examination before approval for engraving.

Alikchi, Indian Territory.
Asheville, North Carolina–Tennessee (resurvey).
Baker City, Oregon.
Bingham Mining Map, Utah.
Bonneterre, Missouri.
Boonville, Indiana.
Broadalbin, New York.
Capistrano, California.
Chestertown, Maryland.
Clyde, New York.
Columbia, Tennessee.
Corona, California.
Davenport, Iowa–Illinois.
Deep Creek, California.
Denzer, Wisconsin.
De Soto, Missouri.
Eagletown, Indian Territory.
Elkader, Iowa–Wisconsin.
Elk Point, South Dakota–Nebraska–Iowa.
Fayetteville, Arkansas.
Florence, Arizona.
Geneva, New York.
Genoa, New York.
Gothenburg, Nebraska.
Grand Teton, Wyoming.
Hamilton, Montana–Idaho.
Hancock, West Virginia–Maryland–Pennsylvania.
Hesperia, California.
Marysville Special, Montana.
Millbrook, New York–Connecticut.
Morrisville, New York.
Mount Leidy, Wyoming.
Mount Lyell, California.
Napa, California.
Nicholas, West Virginia (resurvey).
North Platte, Nebraska.
Ovid, New York.
Palmyra, New York.
Pauls Valley, Indian Territory–Oklahoma.
Petersburg, Indiana.
Phelps, New York.
Portage, Wisconsin (resurvey).
Poynette, Wisconsin.
Redlands, California (resurvey).
Rush Springs, Indian Territory–Oklahoma.
Ste. Genevieve, Missouri–Illinois.
Sandpoint, Idaho.
San Gorgonio, California.
Santa Cruz, California.
Saratoga, New York.
Schunemunk, New York.
Sodus Bay, New York.
Tipton, Iowa.
Tuskahoma, Indian Territory.
Union, Missouri.
Watkins, New York.
Waverly, New York.
Wedowee, Georgia–Alabama.
Weedsport, New York.
Winslow, Arkansas–Indian Territory.

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[1] Called Turkeytrail in Twentieth Annual Report.
[2] Called Waterville in Twentieth Annual Report.

List of atlas sheets revised, corrected, and approved for new editions during the year 1899–1900.

Bolton, New York.
Coos Bay, Oregon.
Crater Lake Special, Oregon.
Cucamonga, California.
Danville, Illinois–Indiana.
Denver, Colorado.
Harrisburg, Pennsylvania.
Hempstead, New York.
Housatonic, Massachusetts–New York–Connecticut.
Kanawha Falls, West Virginia.
Lexington, Nebraska.
Marshall, Arkansas.
Marshall, Missouri.
Maynardville, Tennessee.
Mount Taylor, New Mexico.
Norfolk, Virginia–North Carolina.
Ontario Beach, New York.
Pasadena, California.
Poteau Mountain, Arkansas–Indian Territory.
Stamford, New York–Connecticut.
Utica, New York.
West Point, New York.
Wilson, New York.
Yosemite, California.

Division of Engraving and Printing.

Mr. S. J. Kübel was continued in charge of this division as chief engraver, and was assisted by Mr. H. C. Evans, foreman of copperplate engravers; Mr. R. H. Payne, in charge of transferring to stone; Mr. J. Eckert, in charge of the work of the lithographic power presses, and Mr. O. Schleichert, in charge of the stone work. There were also employed 21 copperplate engravers, 2 photomechanical engravers, 5 lithographic engravers, and 37 printers, transferrers, and assistants.

In addition to the regular duties devolving on him as chief engraver, Mr. Kübel, as has been stated under other headings, performed the duties of editor of topographic maps from July 29, 1899, and supervised the work of the Photographic Laboratory from January 1 to April 30, 1900.

The processes mentioned in the Director's last report as having been introduced continued to be employed with great advantage. The engraving of new topographic atlas sheets was more than doubled last year, the annual output being the largest since this division began doing all of its engraving work—that is, since the discontinuance of the contract system.

Valuable assistance was given by the photolithographic branch to the topographic divisions in the preparation of manuscripts by means of photoliths, photographs, prints on celluloid, etc.

The acquisition of the plant of Mr. Ernest Kübel for the use of the Survey and his engagement as expert mechanician is the only change of importance to be noted. The division is now doing its own plate making and electrotyping and repairs to instruments, all of which was before done by contractors.

The following lists exhibit in condensed form the character and amount of work done in this division during the fiscal year:

New topographic atlas sheets begun during the fiscal year 1899-1900.

Name of sheet.	State or Territory.	Name of sheet.	State or Territory.
San Luis	California.	Spearfish	South Dakota.
Indian Lake	New York.	West Cincinnati	Ohio.
Salamanca	Do.	Fort Payne	Alabama.
Ironton	Ohio.	Cherry Creek	New York.
East Cincinnati	Do.	Westfield	Do.
Anniston	Alabama.	Anamosa	Iowa.
Canajoharie	New York.	Chappell	Nebraska.
Silver Creek	Do.	Evanston	Illinois.
Wilmurt	Do.	Fulton	New York.
Camden	New Jersey.	Oswego	Do.
Dunkirk	New York.	Ogalalla	Nebraska.
Fernando	California.	Schuylerville	New York.
Highwood	Illinois.	Canadian	Indian Territory.
Macedon	New York.	Canton	South Dakota.
Riverside	California.	Ockmulgee	Indian Territory.
Tujunga	Do.	Rancocas	New Jersey.
Canada Lake	New York.	Schoharie	New York.
Lakin	Kansas.	Wewoka	Indian Territory.
Peterboro	New Hampshire.	Lancaster	Wisconsin.
Pingree	North Dakota.	Old Forge	New York.
Toleston	Indiana.	Taconic	Massachusetts.
Whitefield	New Hampshire.	Flatonia	Texas.
Dryden	New York.	Silver Peak	Nevada.
Little Falls	Do.	Elsinore	California.
Syracuse	Kansas.	Oakland	Maryland.
Baldwinsville	New York.	San Jacinto	California.
Accident	Maryland.	Cecilton	Maryland.
St. Croix Dalles	Wisconsin.	Elkland	Pennsylvania.
Maquoketa	Illinois.	Havre de Grace	Maryland.
Sansbois	Indian Territory.	Norway	Michigan.
Betterton	Maryland.	Erie	Pennsylvania.
Cazenovia	New York.	Fairview	Do.
Remsen	Do.	Bucksport	Maine.
Tully	Do.	East Columbus	Ohio.

New topographic atlas sheets begun during fiscal year 1899–1900—C't'd.

Name of sheet.	State or Territory.	Name of sheet.	State or Territory.
Masontown	Pennsylvania.	Girard	Pennsylvania.
Maumee Bay	Ohio.	Engineer Mountain	Colorado.
Toledo	Do.	Orland	Maine.
Riverside	Illinois.	West Columbus	Ohio.
Calumet	Do.	Uniontown	Pennsylvania.
Gaines	Pennsylvania.	Oak Harbor	Ohio.
Iron Mountain	Michigan.	Chicago	Illinois.
Paxton	Nebraska.	Desplaines	Do.

RÉSUMÉ, BY STATES.

Alabama	2	North Dakota	1
California	6	Nevada	1
Colorado	1	New Hampshire	2
Illinois	7	New Jersey	2
Indiana	1	New York	21
Indian Territory	4	Ohio	8
Iowa	1	Pennsylvania	8
Kansas	2	South Dakota	2
Maine	2	Texas	1
Maryland	4	Wisconsin	2
Massachusetts	1	Total	84
Michigan	2		
Nebraska	3		

New topographic atlas sheets and other maps finished during the fiscal year 1899–1900.

Name of sheet.	State or Territory.	Name of sheet.	State or Territory.
Loup	Nebraska.	Westfield	New York.
Vineland	New Jersey.	Canajoharie	Do.
Texas State, No. 1	Texas.	Fort Payne	Alabama.
Texas State, No. 2	Do.	Cherry Creek	New York.
Texas State, No. 3	Do.	Fulton	Do.
Texas State, No. 4	Do.	Iron Mountain	Michigan.
Helena Special	Montana.	Norway	Do.
Lakin	Kansas.	Browns Creek	Nebraska.
Sidney	Nebraska.	Cazenovia	New York.
Indian Lake	New York.	Sallisaw	Indian Territory.
Silver Creek	Do.	Salamanca	New York.

New topographic atlas sheets and other maps finished during the fiscal year 1899–1900—Continued.

Name of sheet.	State or Territory.	Name of sheet.	State or Territory.
Winding Stair	Indian Territory.	Toleston	Indiana.
East Cincinnati	Ohio.	Desplaines	Illinois.
Ironton	Do.	Macedon	New York.
Remsen	New York.	Peterboro	New Hampshire.
Spearfish	South Dakota.	Schuylerville	New York.
Wilmurt	New York.	Anamosa	Iowa.
Dunkirk	Do.	Canada Lake	New York.
Schoharie	Do.	Little Falls	Do.
Anniston	Alabama.	[e] Mount Holly	New Jersey.
Fernando	California.	Pemberton	Do.
Brookwood	Alabama.	Hammonton	Do.
Mitchell	South Dakota.	Mullica	Do.
[a] Morristown	New Jersey.	Betterton	Maryland.
Paterson	Do.	Silver Peak	Nevada.
Plainfield	Do.	Riverside	Illinois.
Staten Island	New York.	Havre de Grace	Maryland.
[b] Hackettstown	New Jersey.	Erie	Pennsylvania.
Lake Hopatcong	Do.	Elsinore	California.
High Bridge	Do.	Lancaster	Wisconsin.
Somerville	Do.	Girard	Pennsylvania.
[c] Cayucos	California.	St. Croix Dalles	Wisconsin.
San Luis Obispo	Do.	Riverside	California.
Port Harford	Do.	Syracuse	Kansas.
Arroyo Grande	Do.	Calumet	Illinois.
[d] Bennington	Vermont.	Canton	South Dakota.
Hoosick	New York.	Pingree	North Dakota.
Greylock	Massachusetts.	Tujunga	California.
Berlin	New York.	Whitefield	New Hampshire.
Alexandria	South Dakota.	Accident	Maryland.
Dover	Delaware.	Baldwinsville	New York.
Evanston	Illinois.	Engineer Mountain	Colorado.
Highwood	Do.	Chicago	Illinois.
Tully	New York.	Sansbois	Indian Territory.
Oswego	Do.	Fairview	Pennsylvania.
Flintstone	Maryland.	Cecilton	Maryland.
Pawpaw	Do.	Dryden	New York.
Sawtooth	Idaho.	Old Forge	Do.
West Cincinnati	Ohio.	Oakland	Maryland.
Chappell	Nebraska.	Flatonia	Texas.
Ogalalla	Do.		

[a] Also combined and published as the Passaic sheet.
[b] Also combined and published as the Raritan sheet.
[c] Also combined and published as the San Luis sheet.
[d] Also combined and published as the Taconic sheet.
[e] Also combined and published as the Rancocas sheet.

RÉSUMÉ, BY STATES.

Alabama	3	Nebraska	5
California	8	Nevada	1
Colorado	1	New Hampshire	2
Delaware	1	New Jersey	12
Idaho	1	New York	24
Illinois	6	North Dakota	1
Indiana	1	Ohio	3
Indian Territory	3	Pennsylvania	3
Iowa	1	South Dakota	4
Kansas	2	Texas	5
Maryland	7	Vermont	1
Massachusetts	1	Wisconsin	2
Michigan	2	Total[1]	101
Montana	1		

[1] It is the custom to consider the reduction of four maps into one sheet as equivalent to the engraving of four atlas sheets. In the above statement of totals each combined map has been counted as four.

Topographic atlas sheets corrected during the fiscal year 1899–1900.

Name of sheet.	State or Territory.	Name of sheet.	State or Territory.
Mother Lode Dist. 1	California.	Brooklyn	New York.
Mother Lode Dist. 2	Do.	Staten Island	Do.
Marshall	Missouri.	Yosemite	California.
Crater Lake	Oregon.	Kanawha Falls	West Virginia.
Marshall	Arkansas.	Pasadena	California.
Poteau Mountain	Do.	Wilson	New York.
Cucamonga	California.	Maynardville	Tennessee.
Mount Taylor	New Mexico.	Housatonic	Massachusetts.
Muskeget	Massachusetts.	Cassville	New Jersey.
Cape May	New Jersey.	Utica	New York.
Poughkeepsie	New York.	Yellville	Arkansas.
New London	Connecticut.	Tacoma	Washington.
Downey	California.	Laurel	Maryland.
Ontario Beach	New York.	Klamath	Oregon.
Indian Valley	California.	Mount Marcy	New York.
Uvalde	Texas.	Strafford	Vermont.
Charleston	West Virginia.	Colfax	California.
Spanish Peaks	Colorado.	Tintic	Utah.
Hempstead	New York.	Denver, East	Colorado.
Texas State	Texas.	Denver, West	Do.
Oyster Bay	New York.	Norfolk	Virginia.

Topographic atlas sheets corrected during fiscal year 1899–1900—C't'd.

Name of sheet.	State or Territory.	Name of sheet.	State or Territory.
Lexington	Nebraska.	Paterson	New Jersey.
Harrisburg	Pennsylvania.	Oelrichs	South Dakota.
Kaaterskill	New York.	Danville	Illinois.
Coxsackie	Do.	Equinox	Vermont.
Beverly	West Virginia.	Santa Monica	California.
Winsted	Connecticut.	Coos Bay	Oregon.
Rico	Colorado.	Coalgate	Indian Territory.
Stamford	Connecticut.	Asbury Park	New Jersey.
West Point	New York.	Blackstone	Massachusetts.
Washington	Dist. Columbia.	Elkton	Maryland.
Philadelphia	Pennsylvania.	Seattle	Washington.
Huntington	West Virginia.	Shamokin	Pennsylvania.
Walsenburg	Colorado.	Stamford	Connecticut.
Bolton	New York.	Cohoes	New York.
Tonawanda	Do.	Rochester	Do.
Harlem	Do.	Roseburg	Oregon.

RÉSUMÉ BY STATES.

Arkansas	3	New York	17
California	9	Oregon	4
Colorado	5	Pennsylvania	3
Connecticut	4	South Dakota	1
District of Columbia	1	Tennessee	1
Illinois	1	Texas	2
Indian Territory	1	Utah	1
Maryland	2	Vermont	2
Massachusetts	3	Virginia	1
Missouri	1	Washington	2
Nebraska	1	West Virginia	4
New Jersey	4	Total	74
New Mexico	1		

Topographic atlas sheets printed and the number of copies delivered during the fiscal year 1899-1900.

Name of sheet.	Copies.	Name of sheet.	Copies.
Salyersville, Ky	2,097	Pisgah, N. C	2,010
Ellendale, S. Dak	2,119	Wilmington, Vt	2,144
Danbury, Conn	2,117	Rico, Colo	2,074
Ishawooa, Wyo	2,113	New London, Conn	2,122
Sunbury, Pa	2,167	Indian Valley, Cal	1,088
Wilkesbarre, Pa	2,065	Winsted, Conn	2,103
Crandall, Wyo	2,131	Beverly, Va	2,052
Londonderry, Vt	2,122	Downey, Cal	2,080
Niagara, N. Y	2,104	Grantsville, Md	2,076
Poughkeepsie, N. Y	2,129	Franklin Furnace, N. J	2,040
Cape May, N. J	1,148	Rico Special, Colo	2,090
Coxsackie, N. Y	2,119	Mother Lode Dist. 1, Cal	2,115
Port Orford, Oreg	2,127	Stamford, Conn	2,117
Kaaterskill, N. Y	2,109	Mitchell, S. Dak	2,126
Atoka, Ind. T	2,100	Browns Creek, Nebr	2,053
Whistle Creek, Nebr	2,078	Dover, Del	107
Clinton, Iowa	2,080	Ontario Beach, N. Y	2,011
Patuxent, Md	2,076	Alexandria, S. Dak	2,061
Loup, Nebr	2,078	Bernal, N. Mex	2,090
West Point, N. Y	2,096	Abingdon, Va	600
Vineland, N. J	2,113	Great Egg Harbor, N. J	2,097
Brookwood, Ala	2,058	Muskeget, Mass	2,088
Williamsburg, Ky	573	Stonington, Conn	2,076
Northampton, Mass	2,084	Brandywine, Md	2,076
Freeport, Me	2,056	Sacketts Harbor, N. Y	2,049
Middletown, Conn	2,055	Little Egg Harbor, N. J	2,063
Delaware Water Gap, Pa	2,002	Pulaski, N. Y	2,090
Hinton, W. Va	542	Glens Falls, N. Y	2,057
St. Paul, Nebr	2,017	Kent, R. I	2,085
Pyramid Peak, Cal	2,072	McCormick, Ga	2,098
Lewisburg, Va	600	Carson, Nev	1,152
Pittstown, Pa	2,090	Cape Vincent, N. Y	2,054
Bridgeton, N. J	2,127	Long Beach, N. J	2,124
Coalgate, Ind. T	2,104	Granby, Conn	2,001
Winchester, Va	2,104	North Conway, N. H	2,098
Harvey Lake, Pa	2,081	Redondo, Cal	2,144
Franklin, W. Va	2,100	Ithaca, N. Y	2,073
Disaster, Nev	1,076	Granville, Mass	2,135
Cranberry, N. C	2,090	Kaibab, Ariz	1,119

Topographic atlas sheets printed and the number of copies delivered during the fiscal year 1899–1900—Continued.

Name of sheet.	Copies.	Name of sheet.	Copies.
Gardner, Me	2,048	Lexington, Nebr	2,116
East Cincinnati, Ohio	2,632	Dublin, Va	582
Anthracite, Colo	611	Crawford Notch, N. H	2,053
Millersburg, Pa	2,104	Gordonsville, Va	2,089
Jasper, Ala	2,096	Olean, N. Y	2,000
Bolton, N. Y	2,078	Princeton, N. J	2,090
Dennisville, N. J	2,136	San Pedro, Cal	2,122
Greenwood Lake, N. J	1,001	Yadkinville, N. C	2,129
Sidney, Nebr	2,094	Red Bluff, Cal	616
Brooklyn, N. Y	2,626	Springfield, Mass	2,135
Paterson, N. J	2,619	Augusta, Me	2,090
Westfield, N. Y	2,110	Provincetown, Mass	2,087
Boston Bay, Mass	1,036	Ironton, Ohio	2,584
Crested Butte, Colo	601	West Cincinnati, Ohio	2,609
Bessemer, Ala	2,132	Saluda, N. C	630
Helena Special, Mont	2,022	Laurel, Md	2,133
Shamokin, Pa	2,080	Doylestown, Pa	2,130
Las Bolsas, Cal	2,095	Cazenova, N. Y	2,122
Harrisburg, Pa	2,133	Harlem, N. Y	3,181
Tacoma, Wash	2,105	Strafford, Vt	2,100
Mount Taylor, N. Mex	2,073	Boston, Mass	1,125
Albuquerque, N. Mex	575	Echo Cliff, Ariz	573
Sacramento, Cal	2,064	Indian Lake, N. Y	2,116
Tully, N. Y	2,114	Staten Island, N. Y	2,565
Sawtooth, Idaho	2,101	Albany, Kans	569
Alturas, Cal	1,104	Sebago, Me	2,051
Christiansburg, Va	1,165	Framingham, Mass	1,110
Cumberland Gap, Ky	1,093	Evanston, Ill	2,113
Las Cruces, N. Mex	612	Holbrook, Ariz	593
Paradise, Nev	609	Klamath, Oregon	1,068
Cherry Creek, N. Y	2,128	Hempstead, N. Y	2,130
Tonawanda, N. Y	2,616	Poteau Mount, Ark	2,108
Wilmurt, N. Y	2,111	Roseburg, Oregon	2,067
Raritan, N. J	2,624	Silver Creek, N. Y	2,052
Yosemite, Cal	2,510	Springville, Ala	595
Peterboro, N. H	2,566	Norway, Me	2,598
Highwood, Ill	2,609	Salamanca, N. Y	2,120
Sanborn, Colo	615	Spearfish, S. D	2,540
Oswego, N. Y	2,626	Big Springs, Colo	583

Topographic atlas sheets printed and the number of copies delivered during the fiscal year 1899-1900—Continued.

Name of sheet.	Copies.	Name of sheet.	Copies.
Cucamonga, Cal	2,060	Sheffield, Mass	2,564
Fort Defiance, Ariz	1,070	Remsen, N. Y	2,567
Norwich, Conn	2,118	Hazard, Ky	2,073
Canajoharie, N. Y	2,102	Engineer Mountain, Colo	2,573
Oswego Special, N. Y	2,627	Las Animas, Colo	610
San Luis, Cal	2,066	Total	317,482
Passaic, N. J	2,547		

Geologic folios completed and delivered during the fiscal year 1899-1900.

Name of folio.	Copies.	Name of folio.	Copies.
51. Big Trees, Cal	4,991	57. Telluride, Colo	5,027
52. Absaroka, Wyo	5,092	58. Elmoro, Colo	5,100
53. Standingstone, Tenn	5,081	59. Bristol, Tenn	5,100
54. Tacoma, Wash	5,022	62. Menominee, Mich	5,100
55. Fort Benton, Mont	5,006	Topographic No. 2	5,191
56. Little Belt Mt., Mont	5,029	Total	55,739

Geologic folios in hand June 30, 1900.

Name of folio.	State or Territory.	Name of folio.	State or Territory.
Bristol	Tennessee.	La Plata	Colorado.
Monterey	Virginia.	Tintic	Utah.
Colfax	California.	Mother Lode Dist	California.
Washington	Dist. of Columbia.	Uvalde	Texas.
Huntington	West Virginia.	Walsenburg	Colorado.
Maynardville	Tennessee.	Charleston	West Virginia.
Spanish Peaks	Colorado.	Housatonic	Massachusetts.

Total, 14.

Miscellaneous maps, pamphlets, circulars, etc., printed and delivered during the fiscal year 1899–1900.

	Copies.
Texas State map	3,220
Seattle forestry map	5,332
Tacoma forestry map	5,160
Connecticut map (2 sheets)	2,111
United States oil and gas map	3,210
Adirondack forestry map	1,259
United States base, contour, and relief maps	7,692
Alaska pamphlets	20,000
Map circulars	28,969
Circular letters	2,919
Photolithographs on map paper	8,608
Photolithographs on drawing paper	243
Photolithographs on celluloid	58
Card blanks	2,080
Signal flags	1,000
Ruled jackets	200
Total	92,061

Totals derived from the foregoing tables.

Engraving of atlas sheets:	
Sheets finished	101
Sheets partly finished	19
Sheets corrected	74
Sheets printed	169
Engraving of folios:	
Folios in hand	15
Folios completed	11
Delivered:	Copies.
Atlas sheets	317,482
Geologic folios	55,739
Miscellaneous	92,061
Grand total, all material delivered	465,282

ADMINISTRATIVE BRANCH.

Division of Documents, Correspondence, and Records.

This division was continued in general charge of the chief clerk, Col. H. C. Rizer, the custody and distribution of the documents and stationery being under the immediate charge of Dr. W. D. Wirt, and the files and records of correspondence and appointments in charge of Dr. W. F. Morsell.

DOCUMENTS AND STATIONERY.

The work of this section has increased during the last year, owing to the growth in publication and in the activities of the Survey generally, but Dr. Wirt and his assistants have performed it in a most satisfactory manner

During the year 195,091 volumes, 30,624 geologic folios, and 342,645 topographic maps were sent out, including those distributed under special Congressional enactments; total, 568,360. The postal authorities handled this large amount of material promptly and without the loss of any important parcel.

The publications received were: Nineteenth Annual Report, Parts II, III, and V, and separates from same; Twentieth Annual Report, Parts I, III, IV, VI, and VI Continued, and separates from same; separate on Precious Stones, from the Twenty-first Annual Report; Bulletins 157 to 163, inclusive; Monographs XXXII (Part II), XXXIII, XXXIV, XXXVI, XXXVII, and XXXVIII; Water-Supply and Irrigation Papers 27 to 33, inclusive; Geologic folios 51 to 58, inclusive; Topographic Folio No. 2, and 176 separate maps, including reissues, a total of 342,374 sheets.

The proceeds from the sale of publications amounted to $6,318.94, of which $3,861.14 was received for maps.

During the year 493 requisitions for stationery and supplies were made upon the Department, and 3,408 office requisitions were filled. Letters relating to documents, stationery, etc., to the number of 43,830 were received, and 57,039 were sent out. The registered packages mailed numbered 20,212.

CORRESPONDENCE AND RECORDS.

The register of letters of a general character received shows that 4,800 communications were briefed, recorded, and appropriately referred for action, and ultimately placed on file when no longer required for answer or other use. The record of letters sent aggregates 4,600 typewritten pages.

The work of this section also includes all records pertaining to appointments, attendance, and leaves of absence, the care and custody of the lantern-slide collection, and the preparation of quarterly reports to the Department.

The appointment records show changes to have occurred during the year as follows: Appointments, by the Secretary of the Interior (including promotions and reappointments as well as original appointments), 248. Of this number 87 were promotions, 81 were original appointments, and the others were renewals, changes of designation, etc. A large proportion of the appointments were of the emergency class—thirty to sixty days. The separations from the service numbered 35, as follows: Death, 1; dropped or services dispensed with, 11; transfers to other bureaus, 7; resignations, 16.

The changes of all kinds occurring during the year will thus be seen to aggregate 283, as against 188 in 1898–99, and 147 in 1897–98.

Division of Disbursements and Accounts.

This division remained in charge of Mr. John D. McChesney, chief disbursing clerk, throughout the year. The high degree of efficiency which has characterized this branch of the office during two decades was maintained. A summarized statement of disbursements follows, and a detailed statement is preserved in the office.

FINANCIAL STATEMENT.

Analysis of disbursements.

Opposite the following heads appear the total expenditures under the various appropriations:

1.	Salaries, office of Geological Survey	$30,989.29
2.	Salaries of scientific assistants	29,492.01
3.	Skilled laborers and various temporary employees	12,996.89
4.	Topography	237,131.17
5.	Geology	103,190.24
6.	Paleontology	8,543.25
7.	Chemical and physical researches	6,417.57
8.	Preparation of illustrations	12,814.52
9.	Mineral resources of the United States	29,503.15
10.	Books for library, etc	1,623.70
11.	Gauging streams, etc	56,308.73
12.	Rent of office rooms, Washington, D. C	6,199.80
13.	Coal and gold resources of Alaska	24,012.87
14.	Engraving and printing geological maps of the United States	60,273.00
15.	Irrigation investigations, Gila River and Queens Creek, Arizona	7,615.42
16.	Surveying forest reserves	127,690.72
17.	Maps of Alaska, Geological Survey	481.25
18.	Locating the ninety-eighth meridian	5,312.58
	Total	760,596.16

Amounts appropriated for and expended by the United States Geological Survey for the fiscal year ending June 30, 1900.

	Geological Survey, 1900.	Geological Survey, 1899 and 1900.	Salaries, office of Geological Survey, 1900.	Geological maps of the United States, 1900.	Surveying forest reserves.	Locating the 98th meridian.	Maps of Alaska, Geological Survey.	Irrigation investigations; Gila River and Queens Creek, Arizona.	Total.
Balance available from prior year					$23,811.14	$5,449.82	$471.36	$7,536.15	$857,809.36
Appropriations: Acts approved February 24, 1899; March 3, 1899. February 9, 1900; March 30, 1900, and June 6, 1900	a $222,012.44	$375,000.00	$31,390.00	$62,500.00	130,000.00		18.50	119.95	
Amounts expended, classified as follows:									
A. Services	127,014.40	228,901.47	30,989.29	51,835.30	89,446.51	3,309.13	257.75	2,846.62	534,600.47
B. Traveling expenses	7,694.05	19,879.03		30.05	6,364.85	172.95		679.53	34,820.46
C. Transportation of property	273.72	3,662.22		2.85	919.62	23.90	21.50	31.32	4,935.13
D. Field subsistence	2,586.60	41,188.69			10,458.20	731.85		1,590.71	56,556.05
E. Field supplies and expenses	5,834.59	42,382.56			11,438.55	787.05		2,455.02	62,897.77
F. Field material	3,267.80	9,802.83			3,215.30	237.35			16,523.28
G. Instruments	1,259.90	9,790.92			2,580.85				13,631.67
H. Laboratory material	1,248.10					15.30			1,263.40
I. Photographic material	2,198.70	2,037.28			164.50				4,400.48
K. Books and maps, etc.	1,623.70	160.11			100.00				1,883.81
L. Stationery and drawing material	597.23	1,251.93			320.96				2,170.12
M. Illustrations for reports	1,895.55								1,895.55
N. Office rents	6,199.80								6,199.80
O. Office furniture	487.00	1,433.17			593.33				2,513.50
P. Office supplies and repairs	1,106.71	1,232.75			270.14				2,609.60
Q. Storage	78.52	359.45			134.69				572.66
R. Correspondence	66.44	282.70		.50	73.28	2.78		11.20	436.90
S. Materials for engraving and printing maps				8,404.30			202.00		8,606.30
T. Railroad accounts settled at U.S. Treasury:									
Passenger	321.30	937.02			814.75				2,073.07
Freight	145.51	1,032.15			795.19	32.27		1.02	2,006.14
Total expenditures	163,899.62	364,334.28	30,989.29	60,273.00	127,690.72	5,312.58	481.25	7,615.42	760,596.16
Balance unexpended July 1, 1900	58,112.82	10,665.72	400.71	2,227.00	25,620.42	137.24	8.61	40.68	97,213.20
Probable amount required to meet outstanding liabilities	58,112.82	10,665.72		2,227.00	25,620.42	137.24		40.68	96,803.88

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[a] This amount includes $35,000 for investigations in Alaska, which continues available during 1901 (Deficiency Act, February 9, 1900). Of this amount ($35,000), $23,000 are now in the hands of special disbursing agents conducting investigations in Alaska.

THE LIBRARY.

The library of the Survey was continued under the charge of Mr. Charles C. Darwin, assisted by Miss Julia L. McCord, Miss M. E. Latimer, and Mr. Thomas K. Gallaher.

The following tabulated statement shows the contents of the library June 30, 1900:

CONTENTS OF THE LIBRARY JUNE 30, 1900.

BOOKS.			
On hand June 30, 1899:			
Received by exchange	31,895		
Received by purchase	12,150		
		44,045	
Received during the past year:			
By exchange	1,419		
By purchase	566		
		1,985	
			46,030
PAMPHLETS.			
On hand June 30, 1899:			
Received by exchange	57,879		
Received by purchase	14,311		
		72,190	
Received during the past year:			
By exchange	2,400		
By purchase	137		
		2,537	
			74,727
MAPS.			
Geologic and topographic maps:			
On hand June 30, 1899		28,135	
Received during the year		800	
			28,935
			149,692

OBITUARY.[1]

OTHNIEL CHARLES MARSH.

Othniel Charles Marsh was born at Lockport, New York, on October 29, 1831. He was the son of Caleb and Mary Peabody Marsh, of Danvers, Massachusetts, a quaint colonial settlement not far from Salem, of which it in early times formed a part. The mother of Othniel Marsh was a sister of George Peabody, the London banker and eminent philanthropist, whose remains lie buried in his native town. They were brought from England in a British war ship and deposited in their present resting place in 1869. The name of the town was changed from Danvers to Peabody in his honor.

During his early boyhood Marsh attended the schools of Lockport and later the Wilson Collegiate Institute, of Wilson, New York. He entered Phillips Academy, at Andover, in 1851, where he pursued the usual classical and mathematical studies preparatory for college, and was graduated in 1856 at the head of his class. From the preparatory academy he went to Yale College, where he followed the prescribed classical course and was graduated in 1860. At that time the elective system of undergraduate courses, as it is now developed at Yale, was almost unknown, and Marsh had but little opportunity, so fully was his time occupied, to carry out any line of study other than that afforded by the regular college curriculum, which embraced elementary instruction in chemistry, mineralogy, and physics. These early collegiate studies aroused in him an enthusiasm for science, which in great measure determined his future professional career. From that time forward he devoted himself with untiring persistency to scientific pursuits, giving his energies to chemistry, mineralogy, and geology.

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[1] Prepared by Mr. Arnold Hague.

Immediately upon the close of his college course he became a post-graduate student of the university and enrolled himself as a student in the Sheffield Scientific School. The autumn of 1860 found him hard at work in the chemical laboratory, devoting his time to mineral analyses and determinative mineralogy and laying broad the foundation of his future career as a paleontologist. His entrance into the scientific department occurred at a most auspicious time, coinciding with the opening of North Sheffield Hall, with its laboratories and lecture courses, which offered to the followers of natural science at Yale opportunities far better and on broader lines than had before been enjoyed. At this time the number of special students of science was small, but their enthusiasm was awakened and they constantly associated on the common ground of kindred pursuits. Throughout these years Marsh probably talked more freely to fellow students about his boyhood days than he was wont thus to talk in later years. He early evinced traits and habits which became dominant characteristics throughout a long life. Shooting and fishing, pastimes of boyhood, became his recreations. The sportsman spirit, developed in youth, remained strong throughout the long period of exploration in the Rocky Mountains, and big-game hunting was to him one of the keenest delights of life.

In the same way the spirit of the collector was shown in school-boy days in a still more marked manner. Fossils, minerals—in fact, all natural curiosities—were gathered by him with intense eagerness, and early in life his collections were considered large and valuable. During his academic years at Andover, and later at Yale, the summers were employed in making extensive collecting trips throughout New England, his journeys being extended as far eastward as Nova Scotia. In these years he made no fewer than five journeys to Nova Scotia, carefully exploring the larger part of the island. On one of the first of these excursions he was so fortunate as to discover in the coal formations at the well-known locality of South Joggins a fossil vertebrate, which he subsequently described as *Eosaurus arcadianus*, in a paper published in the American Journal of Science in 1862 while he was yet a student in the scientific school. Previous to the appearance of this paper he published in the same journal an account of the gold of Nova Scotia. In 1863, shortly after leaving the Sheffield laboratories, he published a catalogue of mineral localities in New Brunswick, Nova Scotia, and Newfoundland, a paper on which he bestowed considerable care and thought, and in the preparation of which he had found much pleasure. Even in those early days his mind turned to explorations and scientific surveys, and in the light of his subsequent career a passage in his article on the Nova Scotia gold fields becomes interesting. He wrote:

> A public geological survey of Nova Scotia is much needed, and a considerable part of it could be made with comparatively little labor, as in some parts of the province the formations are so interesting that they early attracted the attention of scientific men, and have been carefully studied. The districts, however, in which gold has been discovered, and in which it is likely to be found, have been only casually examined, and a systematic survey would make known their real value and prevent the recent discoveries from proving a misfortune by impairing more important branches of industry.

Two years of post-graduate life were passed at Yale, and during this period the foundations of his scientific career were laid. The frequent journeys and excursions undertaken during these and previous years in all probability exerted a far-reaching influence in preparing him for the more difficult and arduous explorations among the Mesozoic and Tertiary formations of the Rocky Mountains.

After leaving the Sheffield School he passed three years in Europe, where he divided his time among the universities of Berlin, Heidelberg, and Breslau, studying under the guidance of many of the leading scientific men of the time. In Europe, as at home, he devoted his vacations to travel, visiting the most celebrated localities or studying glacial phenomena among the classic Alpine fields of Switzerland. While still a student in Germany he published one or two papers of geological interest, one of them being a notice of a new fossil annelid from the lithographic slates of Solenhofen, and the second on a new genus of Jurassic annelids.

Shortly after his return to America, in 1866, he was made professor of paleontology in Yale College, a position he held until his death. About this time, and mainly through the influence of Professor Marsh, his uncle, George Peabody, of London, presented to Yale a fund of $150,000, with which to commence the erection of a science museum. It will be known as the Peabody Museum. Professor Marsh was named curator of geology, and much time and energy were now given to the construction of the present right wing of the museum and at the same time to seeing that it was adapted in every detail to its purposes. One of the objects of Professor Marsh's life, and a subject upon which he frequently conversed in later years, was the erection of the central portion of the museum as originally intended.

The first of the memorable excursions of Professor Marsh to the far West was undertaken in 1868. It followed the route of the Union Pacific Railroad across Nebraska and central Wyoming. This journey, although not specially fruitful in material gathered, led the way to future marvelous explorations among the so-called Tertiary basins of the Rocky Mountains. In the following year he did not reenter the field, owing to Indian warfare in the regions he had planned to explore. The summer of 1870 found him hard at work with renewed zeal. In the meantime he had bestowed careful thought on the problems of Western exploration, and he organized and equipped a large party for arduous duties over a wide field. In this party were twelve or more well-selected young and energetic students from Yale, many of whom have since won distinction in other fields of human activity—in science, in literature, on the bench, in the halls of Congress, and in industrial pursuits. They were an earnest set of fellows, who threw themselves into their work with great zeal. Military escorts were furnished by the Government from the nearest army posts as they were needed, which in many ways rendered efficient aid. The party started, well provided with everything needful, from Fort McPherson, Nebraska, accompanied by an escort from the Fifth Cavalry and several Indian scouts. They first searched the Pliocene formations along the valley of Loup Fork, collecting largely from its varied fauna. A second excursion started from Cheyenne to explore the Miocene beds of northern Colorado exposed in the bold bluffs south of the Union Pacific Railroad and at a number of localities along the North Platte Valley, thence back to Cheyenne. A third party, which made the most important trip of the year, fitted out at the historical old army post, Fort Bridger, and examined the well-known Eocene formations of the Bridger Basin, thence followed southward along Green River to the mouth of White River, where they collected with great success from the Tertiary deposits of that now famous region. Professor Marsh was able to show, from the fossils, that it belonged to the Upper Eocene, and named it the Uinta Basin. From here the party returned to Fort Bridger, over the mountains. California, the next objective point, was reached by rail early in November, the Pliocene deposits on the west side of the Cordillera being studied for comparative purposes. On their return East the party lingered long in Kansas, gathering large stores of valuable material from the Cretaceous deposits since noted for their rare types of fossils—birds with teeth and reptiles without them. Winter overtook the party before they reached home, but meanwhile they had traversed the continent between the plains of Nebraska and the Pacific Ocean.

For several successive years similar expeditions set out from Yale and returned with rare and varied forms of fossil vertebrates. The summers of 1871, 1872, and 1873 found Professor Marsh not only still searching old haunts and bringing to light a marvelous amount of fresh material, but each year reaching out for new fields of exploration.

The first year of Marsh's expedition was a most propitious time for the beginning of his field researches. The pioneer transcontinental railway had spanned the continent the previous year. Public attention was largely directed toward the Rocky Mountains, and everywhere an intense interest was felt in the development of the country opened by the railway. The National Government was taking an enlightened part in this development, and liberal appropriations were annually made by Congress for geological explorations. The same year the railway opened, Major Powell made his famous exploration of the Canyon of the Colorado, starting from Green River City, on the Union Pacific Railroad; Gilbert was at work on the Colorado Plateau; and the Geological Exploration of the Fortieth Parallel had worked east from the Sierra Nevada, across the Great Basin ranges of Nevada and Utah and over the Wasatch to the borders of the Tertiary basins beyond. Still working eastward, the latter organization spent the summers of 1871 and 1872 in the Rocky Mountains and along the base of the Front Range, studying the geological distribution, geological structure, and sediments of the Tertiary basins. Many were the discussions and conferences held between the geologists of this expedition and Professor Marsh as to the true geological position and significance of these remarkable areas. In succeeding years Professor Marsh fitted out similar parties, organized on the plan of the earlier ones, although modified by circumstances and the new problems which presented themselves each season. Later similar parties were sent out from other institutions of learning, modeled upon the Yale expedition of 1870.

For fourteen years, from the time of his early expedition into western Kansas, the heavy expenses of these explorations were borne mainly by Professor Marsh himself. From the railway companies he frequently received passage for himself and parties, and most advantageous terms for transporting his collections, and oftentimes his assistants paid their own personal expenses, but the great burden of expenditure was met from his private resources.

During the winters of 1878 and 1879 the Congress of the United States enacted a law abolishing all the then existing scientific explorations and surveys of the Rocky Mountain region, conducted under different auspices, and in their stead organized the present United States Geological Survey as a bureau of the Department of the Interior. This action was taken only after a prolonged discussion of the subject. Congress, acting conservatively, referred the matter to the National Academy of Sciences, which body, through a committee, after careful consideration of the matter, reported in favor of the legislation finally adopted. The wisdom of this action on the part of Congress and of the Academy has long been recognized, and in shaping this policy Professor Marsh, who was a member of the committee, performed a most creditable part.

On July 1, 1882, Professor Marsh received the appointment of Vertebrate Paleontologist on the United States Geological Survey, and in the service of the National Government he continued systematic investigations for ten years under favorable conditions and with trained assistants, frequently having several collecting parties at work at the same time. His collections increased so rapidly, not only in quantity but in importance to paleontological science, that he became overwhelmed with a mass of material awaiting investigation. In 1892, therefore, he was forced to abandon field work and to devote himself to the preparation of the results of his active labors. He retained his position as Vertebrate Paleontologist on the Survey until the close of his life. His constantly increasing duties in the Peabody Museum became so onerous and absorbing that he was obliged to give much of his time to their consideration.

In 1886, at the solicitation of the Secretary of the Smithsonian Institution, Marsh accepted the position of Honorary Curator of Vertebrate Paleontology in the National Museum, with the purpose of building up that department and placing on permanent exhibition a portion of the material already on hand. In pursuance of this plan he had deposited in the Museum from time to time what would under ordinary circumstances be considered large collections of vertebrates. This position of curator he held until his death.

The first paper published by Professor Marsh relating to the Tertiary fossils of the far West appeared as a short notice in the American Journal of Science in 1868 on a new and diminutive species of fossil horse from Nebraska. Beyond this almost nothing was published prior to 1871 bearing upon his explorations, although several articles upon paleontological subjects appeared from his pen, indicating activity along many lines of research. In this year he published a number of papers bearing directly upon his special field of research, the first fruits of investigations in the workroom upon the fossil material in the Peabody Museum. Some of these were descriptive articles of importance. Others were mere announcements of discoveries with promises of future results. One paper of interest contained descriptions of some new fossil serpents from the Tertiary deposits of Wyoming, and it was quickly followed by an account of a new and gigantic species of pterodactyl, the first recognized on the American continent. This latter announcement was followed the next year by additional descriptions of new species and such facts as rendered the existence of this reptilian group a matter of the highest geological significance. Another paper presented the first careful description of *Hesperornis regalis.* The same year brought numerous announcements of preliminary descriptions of new species of mammals, birds, and reptiles, many of them from the Bridger Eocene, his first field of exploration in Wyoming. Each succeeding year furnished a long list of communications, either reporting new discoveries or giving further descriptions of forms already announced. Most of them were preliminary descriptions, oftentimes fragmentary and insufficient for purposes of comparison, but all contributing something from the vast storehouse of his collections. A list of his publications would number nearly 300 papers scattered throughout various scientific journals, but by far the greater portion of them were first printed in the American Journal of Science, to which he was a regular contributor and of which he served for years as an assistant editor. From the date of his first publication to the year of his death, a period covering thirty-eight years, he never allowed a single year to pass without enriching scientific literature by at least one communication. It would be impossible within the scope of this brief notice to enumerate even the more important contributions and discoveries made by Professor Marsh. In order to form an adequate idea of the work he accomplished, the reader should refer to his published bibliography and catalogue of species described. Here only bare mention can be made of a few of the more wonderful and interesting which bear upon geology and paleontology

In 1873 his time was mainly absorbed in investigating the huge Eocene mammals belonging to his new order Dinocerata. Nevertheless, he found opportunity to announce the discovery of a new species of birds with teeth and to establish his subclass Odontornithes, the remarkable link between birds and reptiles. In the spring of 1874 appeared several papers on the fossil horse in America; these presented an array of facts which established beyond all question the Tertiary ancestry of the horse in this country, dating back to early Eocene time. In rapid succession came a series of papers of the highest significance to science, defining the Brontotheriidæ, Telodontia, and Coryphodontia, not to mention descriptions of genera and species of less importance in the realm of reptiles, birds, and mammals. After careful preparation by the slow and tedious processes of restoration, Professor Marsh made public in 1877 what proved to be the first of an extended series of communications upon the characters of that marvelous reptilian group, the Dinosauria. From that time forward he seemed to be adding continuously to our knowledge of these monster animals, and even as late as the year of his death he prepared an article for the American Journal of Science, entitled Footprints of Jurassic Dinosaurs. Closely associated with his researches upon the dinosaurs came numerous papers upon the Jurassic mammals of Wyoming, of which he had a very complete collection and a comprehensive knowledge of the material in hand.

The first completed monograph ready for the press was published under the auspices of the Geological Exploration of the Fortieth Parallel, from an appropriation set aside for that purpose. It forms the seventh and final volume of the report of the expedition. The preface to the volume bears the signature of Professor Marsh and the date of June 16, 1880, and it was transmitted to the Chief of Engineers by Mr. Clarence King, in charge of the exploration, July 3, 1880. The volume is confined strictly to Marsh's researches upon fossil birds, and is mainly a description of the specimens discovered by himself. The title reads: Odontornithes; a Monograph on the Extinct Toothed Birds of North America: Washington, 1880. It is accompanied by 34 plates and 40 woodcuts. Plate 20 represents the restoration of the now famous fossil *Hesperornis* *regalis*, one-half natural size. The original skeleton stands in Yale College Museum. The second monograph embodying results of his explorations was also issued by the General Government, appearing as Monograph X of the United States Geological Survey publications. The title reads: Dinocerata; an Extinct Order of Gigantic Mammals: Washington, 1884. It is illustrated by 30 large plates, executed with artistic skill and under the author's immediate supervision. The volume brings together in a comprehensive manner a complete record of a peculiar order of huge mammals inhabiting a single Eocene lake basin of Wyoming. No specimens of this order are known from any other part of America, Europe, or Asia. In the Sixteenth Annual Report of the United States Geological Survey, Part I, there appears as one of the accompanying papers an elaborate article from the pen of Professor Marsh on the Dinosaurs of North America, illustrated by 85 plates. It is not presented as a finished monograph, but gives the results of his studies on the dinosaurian reptiles. His plan of final publication embraced several monographs, the illustrations employed in this abstract being primarily intended for the more extended works. In this paper he pays but little attention to the discussion of classification, but deals almost exclusively with description. He had worked long and zealously over this material, and the paper throws much light upon the vast size and completeness of his collections.

Still another important contribution from Professor Marsh, published by the Geological Survey, appears as a chapter in Monograph XXVII, Geology of the Denver Basin. In this chapter he describes the invertebrate fossils characteristic of the Jura, Cretaceous, Miocene, and Pliocene formations exposed in the Denver Basin. He notices the entire absence of the Eocene. The article is profusely illustrated, both in the text and by plates. His groups of beds—the *Hallopus*, the *Atlantosaurus*, with its gigantic Sauropoda, the *Pteranodon*, the *Ceratops*, the *Brontotherium*, and the *Pliohippus*—are all found in this limited region, even many of the type specimens occurring either in or near the basin. Unlike all of his previous papers, this treats the subject more from a geographical and geological standpoint than from an exclusively paleontological one, although the paper is mainly descriptive.

Marsh planned on broad lines commensurate with the wide field covered by his researches. His scheme of publication embraced a series of monographs, each presenting his final results upon some particular group of fossil vertebrates. More or less work had been accomplished upon a number of volumes, such as preparation in museum of type specimens, measurements of skeletons, pencil drawings, printed plates, and fragmentary notes. Some of them were in a far more advanced state of preparation than others. Three of them—those on the Sauropoda, Stegosauria, and Brontotheriidæ—were definitely outlined. The illustrations were all prepared, and in his own mind the monographs were so far advanced toward completion that he permitted them to be announced as in preparation for publication by the Geological Survey. It is earnestly hoped that means will be found to place these volumes before the world. Unfortunately, the completion of the work must be left to others, and much remains to be done.

On New Year's Day, 1898, Professor Marsh made over to Yale University, to be placed in the Peabody Museum, all his personal scientific collections, the result of many years of hard work and of the outlay of a very considerable part of his private fortune. As classified in the deed of gift, the collections were divided into six groups. which were by no means of equal value, viz:

Vertebrate fossils.
Fossil footprints.
Invertebrate fossils.
Recent osteology.
American archæology and ethnology.
Minerals.

Unquestionably the most valuable of them all is the collection of vertebrate fossils. It includes practically everything he obtained during the early years of his Rocky Mountain explorations to the time he became a member of the Geological Survey. Singularly rich in type specimens of reptiles, birds, and mammals, it must always remain of great value.

The collection of recent osteology, obtained largely by purchase, supplements in an admirable manner Marsh's own vertebrate material. In archæology and ethnology are included many famous collections of Mexican and Central American ancient works of art in gold and silver. In the gift to the university is also to be found his valuable early collections of zeolites from Nova Scotia.

Less than a year after the death of Professor Marsh the entire vertebrate collections belonging to the National Government were removed from the Peabody Museum, where they were used for purposes of study and comparison, and brought to Washington, and were by the Director of the Geological Survey transmitted to the Secretary of the Smithsonian Institution for deposit in the National Museum. They include all material gathered by Professor Marsh during the period of his connection with the Survey, embracing many type specimens in all branches of vertebrates. Many of the typical dinosaurs described and figured in various reports and journals belong to this collection. As an indication of the amount of the material, it may be noted that the collection is said to contain fifty specimens of *Titanotherium* skulls. The specimens range from an innumerable number of mammalian teeth up to gigantic skeletons and large blocks weighing several hundred pounds each. Perhaps the best idea of the size of the collection may be obtained from the statement that the transportation of the specimens required nearly 600 boxes, stowed away in 5 freight cars, the material weighing when packed 160,000 pounds. As regards the money value of this immense collection, a high authority familiar with it, intending to make a conservative statement, has estimated it to be worth to-day $150,000.

In this connection it is well to mention the fact that in preparing the collection for shipment from New Haven everything was found in such complete order, and the records were so full, systematic, and accurate, that no question arose as to the disposition of property. The Director of the Survey, in depositing the collection with the National Museum, bestowed high praise upon Professor Marsh in saying: "The transfer of these great collections to Washington without the loss of any material, either through imperfect recording or through misunderstanding as to ownership of specimens, reflects the greatest credit on the business-like methods and integrity of Professor Marsh." The Secretary of the Smithsonian Institution, in acknowledging the receipt of the material, expressed his appreciation of the importance of the collections.

When finally arranged in the Museum the collection will remain a lasting monument to Professor Marsh's scientific ability and devotion to the objects to which he had given his life. It is the duty of every enlightened Government to encourage and foster the search for pure knowledge. No Government of the world surpasses that of the United States in its liberal endowment of scientific research. Professor Marsh received generous aid from the Government, and he on his part returned a hundredfold for what he received. The benefits derived from his researches will always redound to the credit and honor of the country.

The publication of his two monographs at a most opportune time had much to do in establishing the wide reputation of Professor Marsh with an enlightened public. The doctrine of evolution had profoundly stirred not only the scientific world, but an educated and intelligent people. Imperfections in the geological record aroused the attention of thinkers both in America and in Europe. The papers of Professor Marsh, published about this time, on the evolution of the modern horse from a primitive type in early Eocene time by gradual transition, almost step by step as it were, seemed convincing proof of a long period of development. Admirable illustrations of abundant material went a long way toward convincing many minds. Popular illustrated articles in magazines and journals, based upon original records, were read and understood by a somewhat amazed and doubtful people. About the same time the expression "missing links," commonly employed in speaking of the great breaks in the life record of the globe, came into everyday use, even by people who were hardly aware of its original application. It seemed difficult to harmonize with the theory of evolution the great break between reptiles and birds.

The announcement of the discovery of toothed birds, and of fossils having a character transitional between birds and reptiles, and of the marvelous reptiles without teeth, created an intense interest throughout the world.

Professor Huxley, in speaking of these collections, said in 1876: "So far as my knowledge extends, there is no collection from any one region and series of strata comparable for extent or for the care with which the remains have been got together, or for their scientific importance, to the series of fossils which he has deposited there." In a letter to Professor Marsh, Charles Darwin wrote: "Your work on these old birds and on the many fossil animals of North America has afforded the best support to the theory of evolution which has appeared within the last twenty years."

Early in his scientific career Marsh was elected to membership in many of the learned societies in this and other countries, and at the time of his death was enrolled a member in nearly all the royal academies and societies in Europe devoted to science. He was a member of the Geological Society of America and of the Geological Society of Washington. He had the distinction of receiving the first Bigsby medal, awarded in 1877 by the Geological Society of London in recognition of his attainments in paleontology. Twenty-one years later, and shortly before his death, he was awarded by the Institute of France the Cuvier prize, an honor recognized in France as of the highest distinction. In 1886 Harvard University conferred upon him the degree of Doctor of Laws, and the same year the University of Heidelberg gave him the honorary degree of Doctor of Philosophy. He served as one of the vice-presidents of the American Association for the Advancement of Science, and in that capacity delivered an address at Nashville in 1877, his subject being Introduction and Succession of Vertebrate Life in America. Two years later he had the honor of presiding over the association, and delivered a presidential address at Saratoga in August, 1879, on The History and Methods of Paleontological Discovery. Both these addresses received at the time considerable attention, the former giving a comprehensive review of the whole field of his own work in the Rocky

Mountains. The National Academy of Sciences elected him to membership in 1874; in 1883 it made him its president for a term of six years, and honored him with a reelection in 1889. For twelve years he served with distinction as presiding officer, and during that time devoted a large share of his energy to its organization and advancement. Constantly watchful of its interests, every subject that came before the academy for consideration received from him careful attention.

The summer of 1897 found him at St. Petersburg as a delegate to the International Congress of Geologists, where he was elected one of its vice-presidents. During this visit to Europe he was attacked by a serious illness, from which he recovered, but he never fully regained his usual robust health. He died of pneumonia at his residence in New Haven on March 18, 1899, in the sixty-eighth year of his age, after an illness of only a few days. Impressive and simple funeral services were held in Yale College chapel, and his remains were buried in the New Haven cemetery.

Throughout his career of over thirty years as a college professor, Marsh declined to receive any salary in payment for services, and it is said that he never delivered a course of lectures to students. He regarded it as a duty to devote his energies either to the work of exploration or to the multifarious duties of building up the Peabody Museum of Natural Science. Although frequently urged to deliver popular lectures and address audiences from the platform, giving the results of investigation, he invariably declined. He always kept in close touch with the progress of events, but seldom took any part in public affairs, though when he did so it was always with the same energy and persistency which characterized him in private life. He was a good adviser, conservative and cautious, but bold in action. In manner he was always courteous but dignified, and to all except a few friends reserved. Self-reliance he possessed to a degree far beyond most men, but he was always ready to listen to advice. He was a born collector, a trait developed in boyhood, which he maintained until death, ever ready to add something to his numerous treasures. At home as well as in the museum the enthusiasm of the collector pervaded the place. The house itself was a veritable museum, filled with choice Chinese and Japanese curios, artistic furniture, rugs, pictures, porcelains, and Indian trophies. Their collection was one of his recreations. His home, occupying a charming site on Prospect Hill, near the outskirts of New Haven, was in the midst of trees, shrubs, and plants, whose number and variety were constantly increased by new and rare specimens. Here, as a bachelor, he lived quite alone, passing much of his time in the spacious study, surrounded by books and implements of work. With characteristic munificence he bequeathed his home and the land about to the university, to be used as a botanical garden and laboratory. He left the sum of $30,000 to the corporation of Yale to be expended by the trustees of Peabody Museum in preparing and publishing the results of his Western explorations.

Marsh's true rank as a naturalist and as a philosopher must be determined by another generation, after all the results of his investigations shall have been published and his works have stood the scrutiny of time. Those who knew him well and who worked with him in allied branches of science feel confident that high on the roll of fame will be found, clear and bold, the name Othniel Charles Marsh.

APPENDIX TO THE TWENTY-FIRST ANNUAL REPORT

OF THE

DIRECTOR

OF THE

UNITED STATES GEOLOGICAL SURVEY

TRIANGULATION, PRIMARY TRAVERSE, AND SPIRIT LEVELING

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Sonoma, via county road north and east to section 31, Township 6 North, Range 5 West 550

Glen Ellen, along county road, via Warfield, Kenwood, and Melitta, to Santa Rosa 550

Santa Rosa, along county road, via Gwyns Corners, Burk's sanitarium, Mark West Springs, Tarwater and Franz Valley schools, to Calistoga 551

Calistoga, along county road, to St. Helena 552

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Umatilla to Pendleton 554

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Keating post-office, via Palmer's house on Ruckles Creek, to Flagstaff mine 567

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APPENDIX TO DIRECTOR'S REPORT: TRIANGULATION, PRIMARY TRAVERSE, AND SPIRIT LEVELING.

The data included in this appendix has been assembled for publication by Messrs. H. M. Wilson, J. H. Renshawe, E. M. Douglas, and R. U. Goode, chiefs of the Atlantic, Central, Rocky Mountain, and Pacific sections of topography.

TRIANGULATION AND PRIMARY TRAVERSE.

The positions in the following lists are in some cases the results of several years' work, publication of the figures having been withheld heretofore in order to have the report complete, so far as possible, for each area. Many other triangulation stations were finally occupied, but their positions will not be published until checked by final adjustment.

Summary of published results, 1899–1900: Triangulation, primary traverse, meridian marks, and base lines.

Locality.	Triangulation stations.	Traverse stations.	Meridian marks.	Base lines.
ATLANTIC SECTION.				
Maine	13			
New York	13			
Pennsylvania	21	28	9	
Maryland		35		
Alabama	3			
Georgia	8			
CENTRAL SECTION.				
Ohio		36		
Indiana		39	2	
Arkansas		92		
Wisconsin		139	5	
Minnesota		80		
North Dakota		84		

Summary of published results, 1899–1900: Triangulation, primary traverse, meridian marks, and base lines—Continued.

Locality.	Triangulation stations.	Traverse stations.	Meridian marks.	Base lines.
ROCKY MOUNTAIN SECTION.				
Wyoming	60			1
Colorado	24		2	
Texas	37			
PACIFIC SECTION.				
Arizona	17			1
Utah	3			
Washington	59			
California	5			
Total	263	533	18	2

In addition to the above, there have been numerous points of secondary importance located. The positions of 56 such points in Colorado and 19 in Arizona are given in their proper places.

ATLANTIC SECTION OF TOPOGRAPHY.

MAINE.

Triangulation Stations.

The triangulation in this State was based upon the United States Coast and Geodetic Survey positions of Harris, Saunders, and Peaked Mountain. The field work was executed by Mr. W. T. Griswold, topographer. The angles were measured with an 8-inch theodolite.

PASSADUMKEAG MOUNTAIN, PENOBSCOT COUNTY.

On the east end of Passadumkeag Mountain, in the town of Grand Falls.

Station mark: Tall spruce tree blazed on four sides.

[Latitude, 45° 07′ 47.05″. Longitude, 68° 21′ 23.78″.]

To station—	Azimuth.	Back azimuth.	Log. distance.*
	° ′ ″	° ′ ″	*Meters.*
Peaked Mountain	14 18 21.99	194 13 47.83	4.5375904
Greenfield	50 16 23.18	230 12 13.28	4.0014896

PEASLEY HILL, PENOBSCOT COUNTY.

On highest point of bare, grassy hill in the town of Burlington, east of Esculassis Pond.

Station mark: None.

[Latitude, 45° 14′ 51.12″. Longitude, 68° 25′ 24.36″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Greenfield	7 09 40.20	187 08 20.62	4.2943089
Lowell	130 08 41.05	310 06 19.51	3.7554204

GREENFIELD, PENOBSCOT COUNTY.

In the northern part of the town of Greenfield, on the highest point of a bare hill to the west of the road running north from Greenfield post-office, on land owned by George Wheeler.

Station mark: A bronze tablet cemented in solid rock and marked "U. S. Geological Survey—Maine."

Reference mark: White birch tree, S. 69° 02′ W. (true bearing); distance, 90 feet.

[Latitude, 45° 04′ 19.16″. Longitude, 68° 27′ 16.58″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Peaked Mountain	1 38 14.19	181 37 39.46	4.4315444
Mount Saunders	14 37 29.20	194 31 05.14	4.6767627
Eddington	32 24 01.60	212 15 04.58	4.4935783
Bangor	41 34 16.87	221 20 20.57	4.5933951
Mount Harris	50 44 54.33	230 15 31.96	4.8516641
Pea Cove	61 55 37.62	241 45 26.18	4.3316650
Charleston	95 39 41.69	275 15 48.77	4.6478236
Boorston Mountain	114 48 11.83	294 07 45.08	4.9134921
Pine tree	130 29 29.46	310 16 23.27	4.4967068
Lowell	175 18 13.39	355 17 11.34	4.3671279
Peasley Hill	187 08 20.62	7 09 40.20	4.2943089
Passadumkeag Mountain	230 12 13.28	50 16 23.18	4.0014896

PEAKED MOUNTAIN, HANCOCK COUNTY.

A station of the United States Coast and Geodetic Survey, on a bald mountain peak in the town of Clifton, near the Amherst Township line. Road from East Eddington to Amherst passes over north end of mountain. A trail leads from road to station.

Station mark: A bronze tablet marked "U. S. Geological Survey—Maine," cemented in solid rock.

[Latitude, 44° 49′ 44.50″. Longitude, 68° 27′ 51.65″.]

To station—	Azimuth.	Back Azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Saunders	30 36 30.51	210 30 31.96	4.3432196
Riders Bluff	57 55 18.18	237 46 32.73	4.2871294
Mount Harris	71 40 23.99	251 11 30.06	4.7570784
Carmel	81 41 44.17	262 20 23.35	4.6068628
Eddington	92 28 56.68	272 20 25.51	4.2024982
Charleston	125 49 44.81	305 26 19.66	4.7292118
Pea Cove	132 55 32.22	312 45 46.83	4.3946630
Greenfield	181 37 39.46	1 38 04.19	4.4315444
Passadumkeag Mountain.	194 13 47.83	14 18 21.99	4.5375904

LOWELL, PENOBSCOT COUNTY.

On the summit of the highest hill to the east of Cold Stream Pond in the northern part of the town of Lowell.

Station mark: Bronze tablet cemented in solid rock and marked "U. S. Geological Survey—Maine."

[Latitude, 45° 16′ 50.98″. Longitude, 68° 28′ 44.06″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Charleston	66 00 12.01	245 37 18.58	4.6657632
Pine tree	82 38 15.61	262 26 20.16	4.3452270
Peasley Hill	310 06 19.51	130 08 41.05	3.7554204
Greenfield	355 17 11.34	175 18 13.39	4.3671279

MOUNT SAUNDERS, HANCOCK COUNTY.

A station of the United States Coast and Geodetic Survey, situated in the southern part of the town of Dedham on the highest point of a mountain locally known as Bald Mountain.

Station mark: Copper bolt embedded in the rock.

Reference marks: Drill hole in rock on line to Humpback, 18.5 feet distant; drill hole in rock on line to Pigeon, 30.3 feet distant; drill hole in rock on line Mount Desert, 20.0 feet distant; drill hole in rock on line to Isle au Haut, 28.0 feet distant.

[Latitude, 44° 39′ 29.65″. Longitude, 68° 36′ 21″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Harris	91 13 37.14	270 50 43.86	4.6339557
Carmel	114 24 24.24	294 09 01.97	4.5003686
Charleston	147 16 02.79	326 58 39.23	4.7765993
Eddington	166 26 47.89	346 24 16.06	4.3056642
Greenfield	194 31 05.14	14 37 29.20	4.6767627
Peaked Mountain	210 30 31.96	30 36 30.51	4.3432196

EDDINGTON, HANCOCK COUNTY.

On the highest land in the western part of the town of Eddington, 1 mile from Penobscot River and one-half mile north of road from Eddington Bend to East Eddington, on the land of the Coffee heirs, adjoining the farm of S. A. Clapp.

Station mark: A bronze tablet marked "U. S. Geological Survey—Maine," countersunk in ledge of slate rock 1 foot below surface of ground.

Reference marks: Tree in corner of fence bearing south, distance 73 feet. A north and south fence is 11 feet west of station.

[Latitude, 44° 50′ 06.22″. Longitude, 68° 39′ 56.67″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Harris	63 53 55.23	243 33 32.38	4.6297717
Charleston	137 57 26.08	317 42 32.28	4.6152335
Greenfield	212 15 04.58	32 24 01.60	4.4935783
Peaked Mountain	272 20 25.51	92 28 56.68	4.2024982
Mount Saunders	346 24 16.06	166 26 47.89	4.3056642
Rider Bluff	2 23 58.25	182 23 43.52	4.0409257

PEA COVE, PENOBSCOT COUNTY.

In the north part of Oldtown, 1 mile west of the railroad station of Pea Cove, on a gravel ridge to west of Bennock road; land owned by E. M. Foster.

Station mark: A cut-stone post 30 by 6 by 6 inches, sunk 30 inches in the ground, with a bronze tablet cemented in the top, marked "U. S. Geological Survey—Maine."

[Latitude, 44° 58′ 51.07″. Longitude, 68° 41′ 40.88″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Charleston	119 37 45.15	299 24 06.01	4.4645703
Greenfield	241 45 26.18	61 55 37.62	4.3316650
Peaked Mountain	312 45 46.83	132 55 32.22	4.3946630

PINE TREE, PENOBSCOT COUNTY (not occupied).

A lone pine tree standing in front of farmhouse on east side of the road from Lagrange to Maxfield post-office, near a schoolhouse, and in southern part of town of Maxfield.

[Latitude, 45° 15′ 17.84″. Longitude, 68° 45′ 31.16″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Lowell	262 26 20.16	82 38 15.61	4.3452270
Greenfield	310 16 33.27	130 29 29.46	4.4967068

BANGOR, PENOBSCOT COUNTY.

Flagstaff on the top of the water tower in the city of Bangor, Maine.

Station mark: Center of flagstaff.

[Latitude, 44° 48′ 27.18″. Longitude, 68° 47′ 00.50″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Harris	61 27 13.31	241 11 48.28	4.5179486
Greenfield	221 20 20.57	41 34 16.87	4.5933953
Peaked Mountain	264 29 11.45	84 42 41.23	4.4040619

CARMEL, PENOBSCOT COUNTY.

In the southeast part of the town of Carmel on the highest point of Hinckley Hill on land owned by Austin Miller.

Station mark: Bronze tablet cemented in solid rock and marked "U. S. Geological Survey—Maine."

[Latitude, 44° 46′ 31.24″. Longitude, 68° 58′ 11.78″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Harris	49 12 44.67	229 05 12.30	4.2719702
Peaked Mountain	262 20 23.35	81 41 44.17	4.6068628
Mount Saunders	294 09 01.97	114 24 24.24	4.5003686

CHARLESTON, PENOBSCOT COUNTY.

The tower of the Charleston Observatory, situated in the northeast part of the town of Charleston.

Station mark: Center of observatory tower.

[Latitude, 45° 06′ 36.22″. Longitude, 69° 00′ 59.79″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Harris	11 57 05.28	191 51 30.15	4.7034506
Boorston Mountain	134 26 44.78	314 10 13.93	4.6286603
Lowell	245 37 18.58	66 00 12.01	4.6657632
Greenfield	275 15 48.78	95 39 41.69	4.6478236
Pea Cove	299 24 06.01	119 37 45.15	4.4645703
Peaked Mountain	305 26 19.66	125 49 44.82	4.7292119
Eddington	317 42 32.28	137 57 26.08	4.6152335
Mount Saunders	326 58 39.23	147 16 02.79	4.7765993

MOUNT HARRIS, PENOBSCOT COUNTY.

A station of the United States Coast and Geodetic Survey, situated on the highest point of the largest hill in the town of Dixmont.

Station mark: A masonry column about 10 feet high with a base 7 feet in diameter. Hole in center 2 feet in diameter.

Reference marks: Drill hole in rock N. 2° 38′ E., distance 74 feet;

drill hole in rock S. 80° 50′ E., distance 17.3 feet; drill hole in rock S. 72° 50′ W., distance 69.4 feet.

[Latitude, 44° 39′ 54.87″. Longitude, 69° .08′ 54.67″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Charleston	191 51 30.15	11 57 05.28	4.7034506
Carmel	229 05 12.30	49 12 44.67	4.2719702
Greenfield	230 15 31.96	50 44 54.33	4.8516641
Bangor	241 11 48.28	61 27 13.31	4.5179486
Eddington	243 33 32.38	63 53 55.23	4.6297717
Peaked Mountain	251 11 30.06	71 40 23.99	4.7570784
Mount Saunders	270 50 43.86	91 13 37.14	4.6339557

NEW YORK.

Triangulation Stations.

Triangulation was executed in three localities. That in eastern New York, in Saratoga and neighboring counties, was based on the station Prospect of the United States Coast and Geodetic Survey, and Crain of this survey. The field work was by Mr. W. T. Griswold, topographer.

That in the central portion of the State, in Livingston and neighboring counties, was based on the New York State survey positions, Urbana and Swale; this work was also by Mr. W. T. Griswold, topographer.

In the southern part of the State, in Steuben County, the work was based on the New York State survey positions, Swale, Harrison, and Bly. The field work was by Messrs. S. S. Gannett, topographer, and Oscar Jones, assistant topographer. All angles were measured with 8-inch Fauth theodolites.

URBANA, STEUBEN COUNTY.

A station of the New York State survey, situated 3 miles west of the town of Hammondsport, on the land of Thomas Rice.

Station mark: A cut stone post, 48 by 6 by 6 inches, sunk 42 inches in the ground, marked "N. Y. S. S. 405."

[Latitude, 42° 25′ 40.54″. Longitude, 77° 15′ 15.00″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Swale	38 17 13.36	218 07 39.38	4.4994521
Cohocton	101 41 19.98	281 29 54.97	4.3743128

PRATTSBURG, STEUBEN COUNTY.

On the highest point of land near what is locally known as the Red schoolhouse, 3 miles north of the town of Prattsburg. Station about 10 feet from the south line of the farm of Henry Storms and about 810 feet west of the county road.

Station mark: A cut stone post 24 by 6 by 6 inches, set 24 inches in the ground, in center of top of which is cemented a bronze tablet.

Station number: 509.

[Latitude, 42° 32′ 54.32″. Longitude, 77° 19′ 30.74″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cohocton	63 36 40.91	243 28 07.92	4.2869122
Springwater	129 00 35.53	308 52 49.94	4.3044560
Urbana	336 24 03.13	156 26 55.87	4.1624474

WOODHULL, STEUBEN COUNTY.

On a partly cleared ridge about 3 miles southeast of the village of Woodhull, on land owned by M. Brooks. A north-south road runs along side of hill 200 yards west of station. View cut off northeast.

Station mark: A bronze tablet marked "U. S. Geological Survey," cemented in solid rock 2 feet below surface of ground.

Surface mark: A marble post, 30 by 8 by 8 inches, set 24 inches in ground.

[Latitude, 42° 03′ 44.75″. Longitude, 77° 21′ 41.20″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Davis	5 26 44.38	185 25 32.81	4.4156192
Clark	51 01 45.03	230 54 37.02	4.2775229
Harrison	59 54 41.92	239 41 12.00	4.5084492
Swale	145 51 07.20	325 45 54.02	4.2805455
Bly	300 07 55.94	120 21 59.58	4.5264239
Rarick	324 32 53.10	144 41 06.01	4.4672132
Robb	332 30 11.89	152 34 17.78	4.2635457

SWALE, STEUBEN COUNTY.

A station of the New York State survey, in the town of Canisteo, 4 miles west of West Cameron and 1 mile south of Swale Church, on land owned by Mr. Burlingame.

Station mark: A granite post, 48 by 6 by 6 inches, set 42 inches in the ground, marked "N. Y. S. S. 429."

[Latitude, 42° 12′ 16.23″. Longitude, 77° 29′ 28.02″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Harrison	28 11 28.77	208 03 10.47	4.5597210
Cohocton	172 52 17.55	352 50 28.49	4.4743153
Urbana	218 07 39.38	38 17 13.66	4.4994521
Bly	309 18 10.26	129 37 27.79	4.7115144
Woodhull	325 45 54.02	145 51 07.20	4.2805455

SPRINGWATER, LIVINGSTON COUNTY.

On a high timbered ridge between Honeoye and Springwater valleys on land of Chris. Wolfanger, 1 mile east of Tobers Corners.

Station mark: A stone post 30 by 8 by 8 inches, set 24 inches in the ground, in center of top of which is cemented a bronze tablet.

Station number: 511.

[Latitude, 42° 39′ 44.97″. Longitude, 77° 30′ 58.52″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cohocton	4 22 46.49	184 21 58.19	4.3295951
Sand Hill	26 09 19.48	206 05 08.98	4.2827117
Nunda	71 37 21.95	251 22 43.10	4.4940585
Conesus	125 11 36.75	305 06 35.38	4.0924811
Prattsburg	308 52 49.94	129 00 35.53	4.3044560

COHOCTON, STEUBEN COUNTY.

On north end of ridge between Loon Lake and Cohocton River, 2½ miles west of the town of Cohocton. Station is on the line between the farms of Frank Rex and John Loveland and on the highest point of hill. Theodolite elevated 34 feet from ground.

Station mark: A stone, 24 by 8 by 8 inches, set 24 inches in the ground, in center of top of which is cemented a bronze tablet.

Station number: 508.

[Latitude, 42° 28′ 14.75″. Longitude, 77° 32′ 09.92″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sand Hill	120 54 52.08	300 51 30.26	3.9004487
Springwater	184 21 58.19	4 22 46.49	4.3295951
Prattsburg	243 28 07.92	63 36 40.91	4.2869122
Urbana	281 29 54.97	101 41 19.98	4.3743128
Swale	352 50 28.49	172 52 17.55	4.4743153

SAND HILL, STEUBEN COUNTY.

The station is in the corner of field one-eighth of a mile southwest of farm house, on land owned by William Sanders, in the town of Wayland, about 2 miles south of the village of Perkinsville.

Station mark: A stone post 24 by 8 by 8 inches, set 24 inches in the ground, in center of top of which is cemented a bronze tablet.

Station number: 512.

[Latitude, 42° 30′ 27.04″. Longitude, 77° 37′ 08.72″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Nunda	109 09 24.17	288 58 56.92	4.3502399
Springwater	206 05 08.98	26 09 19.48	4.2827117
Cohocton	300 51 30.26	120 54 52.08	3.9004487

CONESUS, LIVINGSTON COUNTY.

In the town of Conesus, 2 miles north and 1 mile east of Conesus Center, on the top of Marback Ridge where it makes the break to the north. The station is on the south side of an east-west highway, about 8 feet from the fence bounding land of S. E. Hitchcock.

Station mark: A stone post 28 by 6 by 6 inches, sunk 28 inches in the ground, in center of top of which is cemented a bronze tablet.

Station number: 510.

[Latitude, 42° 43′ 35.84″. Longitude, 77° 39′ 22.96°.]

To station—	Azimuth.	Back azimuth.	Long. distance.
	° ′ ″	° ′ ″	*Meters.*
Nunda	48 52 44.48	228 43 06.21	4.4122965
Perry	98 19 04.96	278 02 28.65	4.5279600
Scottsville	169 17 34.27	349 14 41.95	4.4897704
Springwater	305 06 35.38	125 11 36.75	4.0924811

SCOTTSVILLE, MONROE COUNTY.

A station of the United States Lake Survey on a timbered hill one-fourth of a mile east of Scottsville station on the Rochester branch of the Erie Railroad.

Station mark: A square cut stone post under ground. Three cut marble reference posts.

[Latitude, 42° 59′ 59.27″. Longitude, 77° 42′ 36.30″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Nunda	16 07 21.29	196 00 33.60	4.6927834
Perry	47 17 04.53	227 03 18.05	4.5749572
Conesus	349 14 41.95	169 17 34.27	4.4897704

Position of this station as given in report of New York State survey is latitude, 42° 59′ 59.22″; longitude, 77° 42′ 36.33″.

NUNDA, LIVINGSTON COUNTY.

In the town of Nunda on the highest point of what is locally known as East Hill.

Station mark: A bowlder 30 inches in diameter, sunk flush with the ground, in center of top of which is cemented a bronze tablet.

Station number: 514.

[Latitude, 42° 34′ 24.22″. Longitude, 77° 52′ 36.47″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Perry	147 23 40.42	327 16 44.05	4.4136080
Scottsville	196 00 33.60	16 07 21.29	4.6927834
Conesus	228 43 06.21	48 52 44.48	4.4122965
Springwater	251 22 43.10	71 37 21.95	4.4940585
Sand Hill	288 58 56.92	109 09 24.17	4.3502399

PERRY, WYOMING COUNTY.

Near the north line fence dividing the lands of Mr. McWethy and Mr. William Fish, in the town of Perry, 2 miles northwest of Perry Center, on the top of a small hill on the farm of Alfred McWethy.

Station mark: A cut stone post 30 by 6 by 6 inches, set 27 inches in the ground, in top of which is cemented a bronze tablet.

Station number: 513.

[Latitude, 42° 46′ 11.35″. Longitude, 78° 02′ 50.76″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Scottsville	227 03 18.05	47 17 04.53	4.5749572
Conesus	278 02 28.65	98 19 04.96	4.5279600
Nunda	327 16 44.05	147 23 40.42	4.4136080

BALD HEAD, WARREN COUNTY.

On a bald-topped mountain in the town of Stony Creek, 5 miles north of Stony Creek Center.

Station mark: Aluminum bolt in solid rock, marked "U. S. G. S., N. Y. 505."

[Latitude, 43° 28′ 47.45″. Longitude, 73° 58′ 02.04″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Wells Peak	1 37 55.35	181 37 45.41	4.0580229
Crain	182 47 12.10	2 47 22.90	3.8598437
Prospect	291 46 19.93	111 54 33.36	4.2400436

WELLS PEAK, SARATOGA COUNTY.

Situated on the highest point of West Mountain, near the line between the towns of Hadley and Day.

Station mark: Aluminum bolt in solid rock, marked "U. S. G. S., N. Y. 506."

[Latitude, 43° 22′ 37.25″. Longitude, 73° 58′ 16.50″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Bald Head	181 37 45.41	1 37 55.35	4.0580229
Crain	182 04 37.41	2 04 58.25	4.2711490
Prospect	253 10 29.16	73 18 29.05	4.2355694

PENNSYLVANIA.

Triangulation Stations.

Triangulation in the northern part of the State, in Tioga and neighboring counties, was based on the New York State survey positions, Harrison and Bly. The field work was by Mr. Oscar Jones, assistant topographer, under the direction of Mr. S. S. Gannett, topographer, the instrument used being an 8-inch micrometer theodolite.

CHAMBERLAIN, TIOGA COUNTY.

On Armenian Mountain, a timbered ridge about 3½ miles southeast of Mainesburg post-office and 4 miles north of Fallbrook postoffice. Station on property of J. A. Chamberlain, who lives 300 yards east. Theodolite elevated 28 feet.

Station mark: A copper bolt 1 inch in diameter cemented in solid rock 14 inches below surface.

Surface mark: Over the copper bolt, a marble block, 12 by 12 by 8 inches, set 14 inches in the ground, in the center of top of which is set a bronze tablet, marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 44′ 33.75″. Longitude, 76° 57′ 19.34″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Brier	26 34 41.38	206 31 22.84	4.1889100
Sampson	79 30 54.51	259 23 16.03	4.2093504
Butts	122 22 25.00	302 18 04.00	4.0307600
Rarick	124 48 54.05	304 40 51.14	4.3087886
Bly	166 01 16.92	345 59 03.06	4.2821831

BLY, TIOGA COUNTY.

A station of the New York State survey, on a partially cleared ridge in Jackson Township, owned A. B. Bly, who lives 400 yards south. Theodolite elevated 24 feet.

Station mark: A 1-inch hole drilled in solid rock 12 inches below surface of ground.

Surface mark: A granite post of the New York State survey, 18 by 8 by 8 inches, set 12 inches in the ground, centered over the station mark.

[Latitude, 41° 54′ 36.03″. Longitude, 77° 00′ 40.06″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sampson	27 38 59.49	207 33 34.08	4.3858632
Putnam	43 38 22.72	223 25 14.16	4.5986590
Rarick	60 02 15.82	239 56 26.12	4.1445663
Davis	74 13 15.22	253 58 02.02	4.5159980
Harrison	90 56 36.30	270 29 05.12	4.7556373
Robb	91 53 37.32	271 43 40.41	4.3139413
Karl	94 44 27.23	274 29 45.50	4.4844239
Woodhull	120 21 59.58	300 07 55.94	4.5264239
Swale	129 37 27.79	309 18 10.26	4.7125144
Chamberlain	345 59 03.06	166 01 16.92	4.2821831

BRIER, TIOGA COUNTY.

On Brier Hill, Liberty Township, 4 miles south of Blossburg and 2 miles north of Eastpoint post-office, on brushy land owned by Morris Run Coal Company. Theodolite elevated 23 feet.

Station mark: A sandstone post, 36 by 8 by 8 inches, set 32 inches in the ground, in top of center of which is cemented a bronze tablet, marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 37′ 05.80″. Longitude, 77° 02′ 17.91″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sampson	140 17 09.19	320 12 49.74	4.1498126
Rarick	158 52 14.66	338 47 31.09	4.4356002
Chamberlain	206 31 22.84	26 34 41.38	4.1889100

BUTTS, TIOGA COUNTY (not occupied).

Flag in a pine tree on highest point of a cleared ridge owned by William Butts, 1 mile east of Mansfield.

Station mark: Center of signal tree.

[Latitude, 41° 47′ 39.86″. Longitude, 77° 3′ 51.98.″]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sampson	38 11 36	218 08 19	4.04428
Rarick	127 27 29	307 23 48	3.98440
Chamberlain	302 18 04	122 22 25	4.03076

SAMPSON, TIOGA COUNTY.

Three miles southeast of Cherry Flats post-office, in Covington Township, on a brushy ridge belonging to the Sampson estate. Theodolite elevated 23 feet.

Station mark: A sandstone post, 36 by 6 by 7 inches, set 34 inches in the ground, in the center of top of which is cemented a bronze tablet, marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 42′ 57.66″. Longitude, 77° 08′ 48.17″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Belfor	102 39 46.39	282 30 47.07	4.2829414
Davis	121 46 57.27	301 37 09.66	4.3782513
Rarick	176 45 33.97	356 45 10.14	4.1641389
Butts	218 08 19.00	38 11 36.00	4.0442800
Chamberlain	259 23 16.03	79 30 54.51	4.2093504
Brier	320 12 49.74	140 17 09.19	4.1498126

HOWELL, LYCOMING COUNTY.

In Lycoming Township, on south end of timbered ridge, 2 miles west of Perrysville post-office, on land owned by Dr. J. H. Howell. Theodolite elevated 10 feet.

Station mark: A sandstone, 48 by 12 by 2 inches, set 40 inches in the ground, in center of top of which is cemented a bronze tablet, marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 20′ 07.07″. Longitude, 77° 09′ 17.05″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Searl	61 25 49.40	241 21 55.15	3.9732097
Harris	62 34 03.00	242 32 01.00	3.68225
Hesse	130 23 08.09	310 18 10.03	4.1382656
Buckhorn Mountain	156 17 06.20	336 15 41.27	3.8706345
Bald Knob	187 09 20.00	7 09 42.00	3.78565
Crescent			3.94149

RARICK, TIOGA COUNTY.

On a brushy ridge about 3 miles west of Lambs Creek post-office. Land owned by James Rarick, who lives about one-half mile south of station. Theodolite elevated 24 feet.

Station mark: A marble post 38 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet, marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 50′ 49.89″. Longitude, 77° 09′ 23.92″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Putnam	35 01 41.71	214 54 22.39	4.4248621
Belfor	59 54 44.92	239 48 08.75	4.3154970
Davis	84 10 27.39	264 01 04.20	4.2919327
Clark	110 48 07.11	290 32 47.75	4.5304672
Karl	117 17 06.21	297 08 14.85	4.3145069
Robb	131 51 31.54	311 47 24.73	4.0583940
Woodhull	144 41 06.01	324 32 53.10	4.4672132
Bly	239 56 26.12	60 02 15.82	4.1445663
Chamberlain	304 40 51.14	124 48 54.05	4.3087886
Butts	307 23 48.00	127 27 29.00	3.9844000
Brier	338 47 31.09	158 52 14.66	4.4356002
Sampson	356 45 10.14	176 45 33.97	4.1641389

ZUCKER, LYCOMING COUNTY.

On a cleared ridge, known as Zucker Hill, in Jackson Township, about 5 miles southwest of Liberty, on land owned by Uriah Alexander. Theodolite elevated 30 feet.

Station mark: A sandstone bowlder 32 by 10 by 6 inches, set 30 inches in the ground, in the center of top of which is cemented a bronze tablet marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 30′ 19.30″. Longitude, 77° 10′ 41.04″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Buckhorn Mountain	4 53 29.40	184 52 59.92	4.0840454
Hesse	40 29 21.77	220 25 18.81	4.1180925
Crawford	93 32 39.26	273 27 51.31	4.0040967
Cedar	122 02 02.02	301 49 05.19	4.5044256
Putnam	140 11 52.21	320 05 25.54	4.3235031
Hemlock	342 57 37.00	162 58 01.00	3.47027

BUCKHORN MOUNTAIN, LYCOMING COUNTY.

On west point of Buckhorn Mountain, 2 miles southwest of Cogan House post-office, in Cogan House Township. The mountain is covered with high timber, and signal target was in top of pine trees about 100 feet above ground.

Station mark: A sandstone post 36 by 8 by 10 inches, set 34 inches in the ground, in the center of top of which is cemented a bronze tablet marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 23′ 47.37″. Longitude, 77° 11′ 25.58″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Searl	124 59 51.04	204 57 21.52	4.0956165
Hesse	105 43 28.48	285 39 55.31	3.8909055
Crawford	144 34 40.47	324 30 22.33	4.1931654
Zucker	184 52 59.92	4 53 29.40	4.0840454
Crescent			4.08617
Howell	336 15 41.27	156 17 06.20	3.8706345

SEARL, LYCOMING COUNTY.

On a timbered ridge, in Mifflin Township, 2 miles northwest of Salladasburg post-office. Theodolite elevated 23 feet. Land owned by Augustan Searl.

Station mark: A marble post 36 by 6 by 6 inches, set 32 inches in the ground, in the center of top of which is cemented a bronze tablet marked "U. S. Geological Survey—Pennsylvania."

[Latitude 41° 17′ 41.17″. Longitude 77° 15′ 11.93″.]

To station—	Azimuth.	Back azimuth.	Log. distanee.
	° ′ ″	″ ′ ″	*Meters.*
Hesse	170 32 59.01	350 31 55.55	4.1331005
Buckhorn Mountain	204 57 21.52	24 59 51.04	4.0956165
Harris	240 10 37.00	60 12 30.00	3.66205
Howell	241 21 55.15	61 25 49.40	3.9732097
Crescent	247 22 34.00	67 30 27.00	4.25609

ROBB, TIOGA COUNTY.

On a cleared ridge about 1 mile west of Farmington Hill post-office. Owner of property, James Robb, who lives 200 yards northwest of station. An east and west road runs 100 yards north of station.

Station mark: A marble post 40 by 8 by 8 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 54′ 57.13″. Longitude, 77° 15′ 33.63″:]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Davis	48 39 52.74	228 34 35.93	4.1639739
Karl	100 27 32.52	280 22 47.82	3.9992705
Clark	100 42 24.12	280 31 11.06	4.3730258
Woodhull	152 34 17.78	332 30 11.89	4.2635457
Bly	27 143 40.41	91 53 37.32	4.3139413
Rarick	311 47 24.73	131 51 31.54	4.0583940

HESSE, LYCOMING COUNTY.

On east end of a timbered ridge in Pine Township, 2 miles south of English Center post-office, on land owned by Mrs. Hesse. Theodolite elevated 30 feet.

Station mark: A sandstone post 36 by 6 by 6 inches, set 32 inches in the ground, in the center of top of which is cemented a bronze tablet marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 24′ 55.58″. Longitude, 77° 16′ 47.98″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cedar	145 21 15.83	325 12 23.03	4.5145574
Putnam	169 11 46.05	349 09 23.05	4.4253561
Crawford	171 35 58.34	351 35 13.63	4.0301527
Zucker	220 25 18.81	40 29 21.77	4.1180925
Hemlock	232 36 19.00	52 40 47.00	4.0720800
Buckhorn Mountain	285 39 55.31	105 43 28.48	3.8909055
Bald Knob	284 09 36.00	104 14 56.00	4.0640500
Crescent	288 53 06.07	109 02 03.05	4.3000254
Howell	310 18 10.03	130 23 08.09	4.1382656
Harris	330 46 36.00	150 49 33.00	4.1050700
Searl	350 31 55.55	170 32 59.01	4.1331005

CRAWFORD, LYCOMING COUNTY.

On a bushy ridge in Pine Township, 1 mile south of Oregon Hill post-office. Land owned by Sam Crawford, who lives 100 yards northwest of station.

Station mark: A sandstone post 36 by 6 by 6 inches, set 32 inches in the ground, in the center of top of which is set a bronze tablet marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 30′ 39.30″. Longitude, 77° 17′ 55.51″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ °	*Meters.*
Cedar	133 44 28.60	313 36 20.10	4.3723846
Putnam	167 33 59.02	347 32 20.71	4.2021037
Zucker	273 27 51.31	93 32 39.26	4.0040967
Buckhorn Mountain	324 30 22.33	144 34 40.47	4.1931654
Hesse	351 35 13.63	171 35 58.34	4.0301527

PUTNAM, TIOGA COUNTY.

On a cleared ridge in Delmar Township, on land owned by William Putnam, who lives 200 yards east of station. Theodolite elevated 25 feet.

Station mark: A sandstone post 36 by 8 by 8 inches, set 32 inches in the ground, in the center of top of which is cemented a bronze tablet marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 39′ 03.38″. Longitude, 77° 20′ 23.69″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cedar	93 06 28.58	272 59 57.88	4.1342086
Stiles			4.4096113
Belfor	166 55 52.32	346 54 37.36	4.0686489
Davis	167 51 01.17	347 48 58.30	4.3061501
Rarick	214 54 22.39	35 01 41.71	4.4248621
Bly	223 25 14.61	43 38 22.72	4.5986590
Zucker	320 05 25.54	140 11 52.21	4.3235031
Crawford	347 32 20.71	167 33 59.02	4.2021037
Hesse	349 09 23.05	169 11 46.05	4.4253561

BELFOR, TIOGA COUNTY.

In Delmar Township, on a spur of main ridge, 3 miles west of Wellsboro. Property of William Belfor, who lives 400 yards south of station.

Station mark: A sandstone post 36 by 6 by 6 inches, set 34 inches in the ground, in the center of top of which is cemented a bronze tablet marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 45′ 13.18″. Longitude, 77° 22′ 18.33″.]

To station—	Azimuth.			Back azimuth.			Log. distance.
	°	′	″	°	′	″	*Meters.*
Cedar	45	43	34.02	225	38	17.92	4.1844405
Davis	169	05	30.61	349	04	42.71	3.9308613
Rarick	239	46	08.75	59	54	44.92	4.3154970
Sampson	282	30	47.07	102	39	46.39	4.2829414
Putnam	346	54	37.36	166	55	52.32	4.0686489

KARL, TIOGA COUNTY.

On a cleared ridge about 4 miles south of Osceola and 1 mile west of Odells Corners. Owner of property is S. D. Karl.

Station mark: A bronze tablet cemented in solid rock 18 inches below surface of ground.

Surface mark: Over the station mark is set a marble slab 18 by 24 by 24 inches, in center of top of which is cemented a bronze tablet marked "U. S. Geological Survey."

[Latitude, 41° 55′ 55.65″. Longitude, 77° 22′ 39.74″.]

To station—	Azimuth.			Back azimuth.			Log. distance.
	°	′	″	°	′	″	*Meters.*
Davis	5	35	11.90	185	34	39.53	4.0608052
Stiles	50	15	02.74	230	08	09.00	4.2695890
Clark	100	48	33.56	280	42	04.89	4.1342760
Bly	274	29	45.50	94	44	27.23	4.4844239
Robb	280	22	47.82	100	27	32.52	3.9992705
Rarick	297	08	14.85	117	17	06.21	4.3145069

DAVIS, TIOGA COUNTY.

On a brushy ridge about 3½ miles south from Chatham Valley post-office. Land owned by Latham Lumber Company.

Station mark: A bronze tablet cemented in solid rock 2 feet below surface of ground and marked "U. S. Geological Survey—Pennsylvania."

Surface mark: Over the station mark is set a sandstone slab 24 inches square, in center of top of which is cemented a bronze tablet marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 49′ 44.59″. Longitude, 77° 23′ 28.27″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cedar	26 05 37.49	206 01 09.00	4.3266037
Clark	138 47 03.81	318 41 08.23	4.2698093
Woodhull	185 25 32.81	5 26 44.38	4.4156192
Karl	185 34 39.53	5 35 11.90	4.0608052
Robb	228 34 35.93	48 39 52.74	4.1639739
Bly	253 58 02.02	74 13 15.22	4.5159980
Rarick	264 01 04.20	84 10 27.39	4.2919327
Sampson	301 37 09.66	121 46 57.27	4.3782513
Putnam	347 48 58.30	167 51 01.17	4.3061501
Belfor	349 04 42.71	169 05 30.61	3.9308613

CEDAR, TIOGA COUNTY.

On land owned by Billings estate, in Ship Township, on highest point of Cedar Run Mountain, which is covered with high dead timber. Theodolite elevated 30 feet.

Station mark: A sandstone post 36 by 8 by 8 inches, set 32 inches in the ground, in the center of top of which is cemented a bronze tablet marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 39′ 26.91″. Longitude, 77° 30′ 11.52″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stiles	168 13 44.65	....	4.2688985
Davis	206 01 09.00	26 05 37.49	4.3266037
Belfor	225 38 17.92	45 43 34.02	4.1844405
Putnam	272 59 57.88	93 06 28.58	4.1342086
Zucker	301 49 05.19	122 02 02.02	4.5044256
Crawford	313 36 20.10	133 44 28.60	4.3723846
Hesse	325 12 23.03	145 21 15.83	4.5145574

CLARK, TIOGA COUNTY.

On a brushy ridge about 1 mile southwest of Purple Brook post-office and 3 miles north of Westfield, on land owned by James Clark, who lives about 300 yards east of station.

Station mark: A marble post 42 by 8 by 8 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet marked "U. S. Geological Survey."

[Latitude, 41° 57′ 18.06″. Longitude, 77° 32′ 20.77″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stiles	3 32 31.09	183 32 05.21	4.1607598
Woodhull	230 54 37.02	51 01 45.03	4.2775229
Robb	280 31 11.06	100 42 24.12	4.3730258
Karl	280 42 04.89	100 48 33.56	4.1342760
Rarick	290 32 47.75	110 48 07.11	4.5304672
Davis	318 41 08.23	138 47 03.81	4.2698093

STILES, TIOGA COUNTY.

On a cleared ridge about 1 mile east of Lansing post-office. Owner of property, Stephen Stiles, lives on northern side of ridge about one-fourth mile from station.

Station mark: A bronze tablet cemented in solid rock 1 foot below surface of ground.

Surface mark: Over the station mark is set a marble slab 10 by 12 by 12 inches, in center of top of which is cemented a bronze tablet marked "U. S. Geological Survey—Pennsylvania."

[Latitude, 41° 49′ 29.64″. Longitude, 77° 32′ 59.53″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Clark	183 32 05.21	3 32 31.09	4.1607598
Karl	230 08 09.00	50 15 02.74	4.2695890
Putnam			4.4096113
Cedar			4.2688985

HARRISON, POTTER COUNTY.

A station established by the New York State survey, 3 miles west of Harrison Valley, Pennsylvania, on a hill cleared toward north and west, and owned by J. J. Downey.

Station mark: A granite post 48 by 6 by 6 inches, set 42 inches in the ground, marked "N. Y. S. S. 228."

[Latitude, 41° 54′ 59.04″. Longitude, 77° 41′ 51.84″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Swale	208 03 10.47	28 11 28.77	4.5597210
Woodhull	239 41 12.00	59 54 41.42	4.5084492
Bly	270 29 5.12	90 56 36.30	4.7556373

Meridian marks.

BEAVER, BEAVER COUNTY.

Location of station: In public park, eastward from court-house.

Station mark: An octagonal sandstone post 60 by 15 by 15 inches, set 40 inches in the ground, in the center of the top of which is cemented a bronze tablet.

Distant mark: North of station 603 feet; an octagonal sandstone post 70 by 15 by 15 inches, set 40 inches in the ground, in the center of the top of which is cemented a bronze tablet.

Resident referee: The county surveyor.

CLARION, CLARION COUNTY.

Location of station: In court-house grounds west of the building.

Station mark: A stone post 48 by 12 by 12 inches, set 42 inches in the ground, in the center of the top of which is cemented a bronze tablet.

Distant mark: South of station 401.2 feet, in public park, south of Main street; a stone post 48 by 12 by 12 inches, set 42 inches in the ground, in center of top of which is cemented a bronze tablet.

Resident referees: The county commissioners.

GREENSBURG, WESTMORELAND COUNTY.

Location of station: In park connected with the high school, just west of the northwest corner of the building.

Station mark: A stone post 40 by 8 by 8 inches, set 36 inches in the ground, on center of top of which is cemented a bronze tablet.

Distant mark: South of station 234.4 feet; a stone post similar to that at station, set 38 inches in the ground just south of driveway and east of Main street.

Resident referee: The county surveyor.

INDIANA, INDIANA COUNTY.

Location of station: In Normal School grounds, eastward from the main building.

Station mark: A sandstone post 40 by 8 by 8 inches, set 38 inches in the ground, in the center of the top of which is cemented a bronze tablet. Reference mark: Southeast corner of Normal School building; S. 88° 03′ W., distant 156.75 feet.

Distant mark: North of station 627.3 feet; a sandstone post similar to station mark, set 38 inches in the ground. Reference mark: Southeast corner of Model School building, S. 70° 10′ W., distant 156.5 feet.

KITTANNING, ARMSTRONG COUNTY.

Location of station: In grounds connected with city reservoir, about one-fourth mile north of court-house.

Station mark: Stone post 36 by 8 by 8 inches, set 33 inches in the ground, in the center of the top of which is cemented a bronze tablet. Reference marks: Board fence, east 68.1 feet; board fence, south 4 feet.

Distant mark: North of station (across the reservoir), about 400 feet, a post similar to that at the south station. Reference marks: Board fence, east 49 feet; board fence, north 4.2 feet.

MANSFIELD, TIOGA COUNTY.

Location of station: Southwest of South Hall, State Normal School.

Station mark: Sandstone post 42 by 8 by 8 inches, set 40 inches in the ground, in center of top of which is cemented a bronze tablet. Reference mark: Academy street (curb), 14 feet west.

Distant mark: North of station 213.5 feet; a sandstone post similar to station mark. Reference marks: Walk, 4.5 feet north; South Hall, 87.7 feet east.

WELLSBORO, TIOGA COUNTY.

Location of station: In public park, southeast of court-house.

Station mark: Marble post 46 by 6 by 6 inches, set 43 inches in the ground, in center of top of which is cemented a bronze tablet.

Distant mark: North of station 335.9 feet; a marble post 40 by 6 by 6 inches, set 36 inches in the ground, in center of top of which is cemented a bronze tablet.

Resident referees: The county commissioners.

WILLIAMSPORT, LYCOMING COUNTY.

Location of station: In Brandon Park, about 300 feet east of west, or main, entrance to the park.

Station mark: Sandstone post 40 by 8 by 8 inches, set 36 inches in the ground, in the center of the top of which is cemented a bronze tablet.

Distant mark: North of station 519.3 feet, a sandstone post similar to station mark.

Resident referee: R. H. Faries, civil engineer.

YORK, YORK COUNTY.

Location of station: Pennsylvania Park.

Station mark: A sandstone post, 40 by 6 by 6 inches, having a bronze tablet cemented in its top, and set 36 inches in the ground, 430 feet east of center of Water street and 57 feet north of center of Fulton street.

Distant mark: North of station 506 feet; a sandstone post, 40 by 6 by 6 inches, having a bronze tablet cemented in its top and set 36 inches in the ground, 88 feet from the flagstaff and 205 feet from Soldiers and Sailors' monument.

MARYLAND—PENNSYLVANIA.

Primary Traverse.

Sixty-three geographic positions were determined in Maryland and Pennsylvania by primary railroad traverse, by W. Carvel Hall, topographer, in September and October, 1899. The traverse begins at Washington Monument, Baltimore, Maryland, follows the Baltimore and Lehigh and York Southern railroads to York, Pennsylvania, thence southward along the Northern Central Railway to station 8 of the first line. The western line of traverse starts at the northwest corner of the city of Baltimore and follows the Western Maryland Railroad to York, Pennsylvania, closing on an azimuth station of the first line.

Geographic positions along the Baltimore and Lehigh and York Southern railroads.

Stations.	Latitude.	Longitude.
MARYLAND.	° ′ ″	° ′ ″
Baltimore, Washington Monument	39 17 51.16	76 36 57.26
Homeland station, road crossing at	39 22 07.5	76 37 57.1
Eudowood station	39 23 54.5	76 35 28.8
Loch Raven station	39 25 15.6	76 32 12.1
Notch Cliff station, road crossing at	39 26 36.0	76 30 35.0
Hyde station, road crossing at	39 29 02.6	76 29 36.3
Laurel Brook station, road crossing at	39 30 30.5	76 25 39.2
Fallston station, road crossing at	39 30 55.3	76 24 37.1
Belair station, road crossing at	39 32 24.1	76 21 23.8
Forest Hill station, road crossing at	39 35 06.1	76 23 15.5
Ferncliff station, road crossing one-half mile north of	39 37 35.4	76 24 01.2
Minefield station, road crossing at	39 39 08.7	76 22 58.9
Pylesville station, second road crossing south of.	39 41 19.7	76 22 26.1
PENNSYLVANIA.		
Maryland-Pennsylvania boundary line monument	39 43 16.2	76 21 17.3
Castle Fin station	39 45 51.7	76 21 20.7
Woodbine station	39 47 12.4	76 24 22.1
Bruce station, road crossing at	39 47 41.7	76 26 44.5

Geographic positions along the Baltimore and Lehigh and York Southern railroads—Continued.

Stations.	Latitude.	Longitude.
PENNSYLVANIA—continued.	° ′ ″	° ′ ″
Muddy Creek station	39 48 30.7	76 28 31.6
Laurel station, road crossing at	39 49 33.8	76 30 37.1
Brogueville station, road crossing at	39 50 34.3	76 31 58.3
Windsor station, road crossing at	39 52 11.8	76 33 48.2
Red Lion station	39 54 07.8	76 36 28.1
Relay station	39 54 53.4	76 38 40.6
Enterprise station, road crossing at	39 56 38.4	76 39 45.2
York, corner King street and railroad tracks	39 57 53.3	76 42 57.7
York, south azimuth stone	39 57 20.1	76 43 36.8

Geographic positions along the Northern Central Railway.

Stations.	Latitude.	Longitude.
PENNSYLVANIA.	° ′ ″	° ′ ″
Grantley station, road crossing at	39 56 56.2	76 44 10.2
Milepost 51 B, crossing 500 feet north of	39 53 46.1	76 44 43.1
Glatfelters station, road crossing at	39 52 28.0	86 45 01.7
Larne station, road crossing at	39 49 12.5	76 45 37.8
Seitzland station, road crossing at	39 47 09.2	76 43 23.2
New Freedom station	39 44 25.7	76 42 03.0
Maryland-Pennsylvania State line, crossing of Northern Central Railway	39 43 17.5	76 41 54.3
MARYLAND.		
Bentley station	39 40 31.1	76 40 15.6
Parkton station	39 38 33.2	76 39 36.4
Blue Mount station	39 36 09.6	76 37 21.4
Glencoe station	39 33 03.4	76 38 10.8
Phœnix station	39 31 08.6	76 37 10.7
Cockeysville station, crossing of turnpike at	39 29 02.8	76 38 43.6
Timonium station	39 26 23.4	76 37 50.0
Lake station	39 23 27.3	76 38 28.7
Mount Washington, road crossing at	39 22 04.5	76 39 07.2
Melvale, road crossing at	39 20 44.0	76 38 54.2

Geographic positions along the Western Maryland Railroad.

Stations.	Latitude.	Longitude.
MARYLAND.	° ′ ″	° ′ ″
Baltimore, northwest corner stone	39 20 24.9	76 41 22.2
Howardsville station, road crossing at	39 21 42.5	76 43 15.7
Mount Wilson station, road crossing at	39 22 59.7	76 45 25.8
Owings Mill station, pike crossing at	39 25 09.9	76 46 49.0
St. George station	39 27 56.6	76 48 30.1
Woodensburg station, road crossing three-fourths of a mile south of	39 29 37.0	76 49 46.0
Fairview station, road crossing at	39 31 51.0	76 49 22.5
Arcadia station, road crossing at	39 33 50.0	76 50 16.1
Hampstead station, road crossing three-fourths of a mile north of	39 37 01.9	76 51 20.0
Maple Grove station, road crossing at	39 39 01.8	76 51 36.5
Alesia station, road crossing at	39 41 05.9	76 49 40.6
Maryland-Pennsylvania State line	39 43 14.6	76 50 43.6
PENNSYLVANIA.		
Summit station, road crossing at	39 44 21.0	76 50 26.1
Glenville station, road crossing at	39 45 33.1	76 49 00.4
Sinsheim station	39 48 17.0	76 51 59.9
Junction of railroads, road crossing northeast	39 49 55.0	76 53 34.4
Spring Grove station	39 52 14.3	76 51 56.0
Thomasville station, road crossing at	39 55 44.2	76 51 03.4
Botts station	39 56 08.8	76 48 55.6
York, corner Market and Water streets	39 57 41.1	76 43 55.1

ALABAMA-GEORGIA.

Triangulation Stations.

The triangulation in these States is based on the United States Coast and Geodetic Survey positions, Indian Mountain and Carnes Mountain. The field work was executed by Mr. W. T. Griswold, topographer, using an 8-inch micrometer theodolite.

NEWNAN, COWETA COUNTY, GEORGIA.

Standpipe in the southwestern part of the town of Newnan.

Station mark: Center of stand pipe.

[Latitude, 33° 22′ 09.81″. Longitude, 84° 48′ 09.72″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Blackjack	99 51 41.72	279 36 23.56	4.6407697
Oak Mountain	136 51 02.54	316 43 52.28	4.4686557

CARNES, POLK COUNTY, GEORGIA.

A station of the United States Coast and Geodetic Survey, on a small hill 2 miles east of Rockmart.

Reference mark: A cut stone post on the northeast break of top of hill, 8.6 feet distant from what appeared to be the original station mark.

[Latitude, 33° 59′ 35.76″. Longitude, 85° 00′ 50.03″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Indian	96 19 24.20	276 05 35.70	4.5823753
Horse Leg	142 39 03.66	322 31 38.23	4.5251157

OAK MOUNTAIN, CARROLL COUNTY, GEORGIA.

On a small hill 4 miles east of the town of Carrollton.

Station mark: Oak tree which was cut off 24 feet from the ground for theodolite support.

[Latitude, 33° 33′ 45.85″. Longitude, 85° 01′ 09.79″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Blackjack	58 33 17.92	238 25 07.93	4.4294345
Turkey Heaven	89 26 22.22	269 12 00.71	4.6042384
Talley	127 53 39.56	307 45 36.95	4.4536641
Reeds	145 46 08.35	325 42 23.02	4.2700997
Newnan Standpipe	316 43 52.28	136 51 02.44	4.4686557

REIDS, HARALSON COUNTY, GEORGIA.

On lone hill 1 mile southeast from the town of Bremen.

Station mark: Lone signal tree.

[Latitude, 33° 42′ 05.47″. Longitude, 85° 07′ 56.68″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Blackjack	22 52 57.43	202 48 31.50	4.5044654
Talley	99 42 47.31	279 38 29.65	4.0837480
Stead	119 19 47.48	299 07 01.33	4.6086044
Oak Mountain	325 42 23.03	145 46 08.35	4.2700997

FELTON, HARALSON COUNTY, GEORGIA.

On Dugdown mountain 200 yards east of road over mountain from Hickman Junction, 2½ miles east of the town of Felton.

Station mark: A black-jack tree.

[Latitude, 33° 54′ 29.98″. Longitude, 85° 11′ 34.72″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Talley	16 52 48.59	196 50 31.53	4.3392057
Stead	84 07 28.14	263 56 41.51	4.4764885
Horse Leg	173 56 14.33	353 54 50.56	4.5591658

HORSE LEG, FLOYD COUNTY, GEORGIA.

On highest point of Horse Leg Mountain, north of Coosa River and west of the city of Rome.

Station mark: Trimmed tree.

[Latitude, 34° 13′ 59.52″. Longitude, 85° 14′ 04.27″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Indian	38 06 37.62	218 00 12.25	4.4555885
Carnes	322 31 38.23	142 39 03.66	4.5251157
Felton	353 54 50.56	173 56 14.33	4.5591658

TALLEY, HARALSON COUNTY, GEORGIA.

On the top of a lone hill about 300 feet high, called Talley Mountain, 2 miles southeast of the town of Tallapoosa.

Station mark· Large chestnut oak signal tree.

Reference mark: Copper bolt in solid rock near southwest side of tree.

[Latitude, 33° 43′ 11.63″. Longitude, 85° 15′ 40.95″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Turkey Heaven	44 44 09.74	224 37 49.03	4.4011820
Stead Mountain	127 11 59.54	307 03 31.47	4.4693350
Felton	196 50 31.53	16 52 48.59	4.3392057

BLACKJACK, HEARD COUNTY, GEORGIA.

On the north end of Blackjack Mountain, near the Alabama-Georgia line. A road from Graham passes over mountain about one-fourth of a mile south of station.

Station mark: A small black jack oak cut off 26 feet from ground for instrument support.

[Latitude, 33° 26′ 09.80″. Longitude, 85° 15′ 57.58″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Turkey Heaven	128 09 00.35	308 02 50.24	4.3423768
Reids	202 48 31.50	22 52 57.43	4.5044654
Oak Mountain	238 25 07.92	58 33 17.92	4.4294345
Newnan stand pipe	279 36 23.56	99 51 41.73	4.6407697

INDIAN, CHEROKEE COUNTY, ALABAMA.

A station of the United States Coast and Geodetic Survey, on the highest point of Indian Mountain, about 1½ miles west of the Georgia-Alabama line.

Station mark: A hole drilled in solid rock 2 feet below surface of ground.

[Latitude, 34° 01′ 49.94″. Longitude, 85° 25′ 31.10″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stead	26 29 21.13	206 26 20.63	4.2699742
Horse Leg	218 00 12.25	38 06 37.63	4.4555885
Carnes	276 05 35.70	96 19 24.20	4.5823753
Felton	302 11 59.70	122 19 47.02	4.4047060

TURKEY HEAVEN, CLEBURNE COUNTY, ALABAMA.

On an eastern spur from the north end of Turkey Heaven Mountain.

Station mark: Oak signal tree.

Reference mark: Triangle cut on granite ledge 4 feet southwest from tree.

[Latitude, 33° 33′ 30.36″. Longitude, 85° 27′ 08.20″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stead Mountain	170 45 23.09	350 43 17.60	4.5583062
Talley	224 37 49.03	44 44 09.74	4.4011820
Oak Mountain	269 12 00.71	89 26 22.22	4.6042384
Blackjack	308 02 50.24	128 09 00.35	4.3423768

STEAD MOUNTAIN, CLEBURNE COUNTY, ALABAMA.

On the southeast of the range of mountains known as Okey Mountains.

Station mark: Oak signal tree.

Reference mark: Aluminum bolt sunk in solid rock near north side of tree.

[Latitude, 33° 52′ 48.93″. Longitude, 85° 30′ 54.26″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Indian	206 26 20.63	26 29 21.13	4.2699742
Felton	263 56 41.51	84 07 28.14	4.4764885
Talley	307 03 31.47	127 11 59.54	4.4693350
Turkey Heaven	350 43 17.60	170 45 23.09	4.5583062

CENTRAL SECTION OF TOPOGRAPHY.

OHIO.

Primary Traverse.

The following geographic positions were determined by Mr. George T. Hawkins during the field season of 1899 from primary traverse beginning at St. Mary's Church in Toledo, the latitude and longitude of the church spire having been determined by the United States Lake Survey. Lines were extended from this position to control the Toledo, Oak Harbor, and Maumee Bay quadrangles.

Lines follow Lake Shore and Michigan Southern Railway from Toledo to State line northwest of Sylvania, and from Toledo to State line northeast of Alexis; Toledo, St. Louis and Kansas City Railroad from Toledo to Waterville; Hocking Valley Railway from Toledo to Lemoyne; Lake Shore and Michigan Southern Railway from Toledo to eastern edge of Oak Harbor quadrangle.

Geographic positions in Ohio.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
St. Mary's Church spire	41 39 33.02	83 32 03.71
Park, Lake Survey station	41 39 57.95	83 30 37.24
Summit avenue and Wheeling and Lake Erie Railroad crossing	41 40 41.8	83 29 49.8
Michigan and Ash streets, corner of	41 40 04.8	83 31 00.2
Ironville station, crossing at	41 40 19.0	83 29 05.3
Booth station, crossing east of	41 38 16.9	83 24 50.8
Curtis, crossing 1,000 feet east of	41 37 04.7	83 22 07.0
Trowbridge, crossing 150 feet east of	41 34 46.8	83 16 51.3
Trowbridge, 4½ miles southeast of; crossing 900 feet west of head block	41 33 00.3	83 12 46.8
Oak Harbor station, crossing 700 feet east of	41 31 11.8	83 08 44.4
Lacarne, crossing 2¾ miles east of	41 31 09.0	82 59 36.2
Lacarne, crossing 1,000 feet east of station	41 31 09.9	83 02 22.0
Bancroft street, Michigan Central Railroad crossing	41 39 48.9	83 34 22.4
Bancroft street, Lake Shore Railway crossing	41 39 48.7	83 34 38.2
Ottawa Park, forks of road at southwest corner of	41 39 47.2	83 36 28.8
Central avenue, crossing at	41 40 36.0	83 40 17.5
Sylvania, crossing 400 feet west of	41 42 30.8	83 42 06.6
State line, crossing of	41 43 30.8	83 42 34.7
State line, crossing 1 mile north of	41 44 21.2	83 43 27.0
West Toledo station	41 41 25.7	83 33 24.5

Geographic positions in Ohio—Continued.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Lake Shore Railway, crossing of pike	41 41 59.9	83 32 55.0
State line and Lake Shore Railway crossing	41 43 52.3	83 31 18.2
Schoolhouse, crossing at	41 44 23.6	83 30 51.2
Michigan Central and Toledo, St. Louis, and Kansas City railroads crossing	41 37 34.4	83 34 24.4
Crossing 2 miles southwest of last	41 36 16.7	83 35 52.6
Maumee, crossing 320 feet northeast of station	41 33 56.5	83 39 20.3
Waterville, crossing 2½ miles north of	41 32 11.3	83 42 36.2
Waterville station, first crossing south of	41 30 01.3	83 43 30.9
Fassett street, crossing at	41 37 43.8	83 31 41.3
Walbridge, first crossing south of	41 34 36.4	83 29 38.2
Lemoyne, crossing 2 miles north of	41 31 19.5	83 28 50.8
Lemoyne, crossing of pike at	41 29 45.2	83 28 27.0
Toledo, St. Louis, and Kansas City and Wabash railroads, crossing of	41 37 18.0	83 34 48.2
Crossing 2 miles southwest of Michigan Central Railroad crossing	41 36 44.3	83 35 37.2
Michigan Central and Lake Shore railroads crossing	41 38 20.9	83 34 25.6
Long Bridge, at east end of truss	41 37 53.2	83 32 21.6

INDIANA.

Primary Traverse.

Geographic positions were determined by Mr. George T. Hawkins, topographer, by primary traverse, during the field season of 1899. Starting from United States Coast and Geodetic Survey astronomic station at Henderson, Kentucky, the traverse follows the Illinois Central Railroad to Evansville, Indiana, thence over Louisville, Evansville and St. Louis Consolidated Railroad (the "Air Line,") to Oakland City via Huntingburg, thence over Evansville and Terre Haute Railroad to Evansville, and joins line at station 43, completing a circuit.

Geographic positions in Indiana.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Henderson astronomic pier	37 50 24.80	87 35 26.10
Crossing at north end Evansville fair ground	37 57 51.0	87 32 31.8
Section corner at white school, 4 miles east of Evansville	37 59 33.5	87 29 29.2
Section corner at negro school, 5 miles east of Evansville	37 59 33.3	87 28 22.5

Geographic positions in Indiana—Continued.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Chandler station	38 02 29.2	87 22 09.4
Quarter corner between secs. 31 and 36, T. 5 S., R. 8 and 9 W	38 02 34.5	87 21 28.0
Boonville station	38 02 48.4	87 16 22.5
Corner secs. 30, 31, 36 and 25, T. 5 S., Rs. 7 and 8 W	38 02 56.3	87 14 44.1
Degonia station	38 03 31.4	87 11 09.1
Quarter corner between secs. 13 and 18, T. 5 S., Rs. 6 and 7 W	38 05 01.8	87 07 50.0
Tennyson station	38 04 58.8	87 07 00.7
Gentryville station	38 06 17.6	87 01 55.4
Rockport Junction	38 06 30.8	87 00 19.9
South corner secs. 31 and 32, T. 4 S., R. 5 W	38 07 10.3	86 59 50.8
Lincoln station	38 07 17.3	86 59 52.4
Dale station	38 09 51.7	86 58 29.5
Quarter corner between secs. 4 and 9, T. 4 S., R. 5 W	38 11 36.2	86 58 07.7
Ferdinand station	38 13 07.4	86 57 16.3
Huntingburg station	38 17 58.6	86 56 54.6
Quarter corner between secs. 19 and 24, T. 2 S., Rs. 5 and 6 W	38 19 43.0	87 00 58.2
Duff station	38 19 42.5	87 01 29.6
Velpen station	38 21 24.6	87 06 06.2
Hartwell Junction	38 21 47.7	87 08 27.4
Center sec. 2, T. 2 S., R. 7 W	38 22 19.8	87 09 14.6
Winslow station	38 22 39.3	87 12 31.0
Corner secs. 9, 10, 15, and 16, T. 2 S., R. 8 W	38 21 00.6	87 17 45.7
Oakland, city station	38 20 25.5	87 20 34.9
Station 5 miles north of Oakland (no name)	38 24 15.6	87 17 59.6
Quarter corner between secs. 21 and 22, T. 1 S., R. 8 W	38 24 57.0	87 17 43.8
Hosmer station	38 25 04.7	87 17 50.4
Somerville station	38 16 43.5	87 22 36.9
Quarter corner between secs. 14 and 15, T. 3 S., R. 9 W	38 15 13.6	87 23 26.1
Lynn station	38 11 43.7	87 25 28.5
Center sec. 17, T. 4 S., R. 9 W	38 10 26.1	87 26 12.8
Elberfield station	36 09 37.1	87 26 42.7
Northwest corner sec. 6, T. 5 S., R. 9 W	38 07 23.6	87 28 15.9
Corner sections	38 04 06.3	87 30 07.8
Corner sections	38 03 05.1	87 31 04.0
Junction 2 miles north of Evansville	38 01 03.7	87 32 19.2

Meridian Marks.

BOONVILLE, WARRICK COUNTY.

Location of station: In grounds of County Fair Association, inside the half-mile race track.

Station mark: A limestone post 40 by 7 by 7 inches, set 38 inches in the ground, in the center of the top of which is cemented a bronze meridian-mark tablet. Reference marks: Oak tree 8 inches in diameter N. 4° E., 270 feet distant. Oak tree 30 inches in diameter N. 76° E., 228 feet distant.

Distant mark: North of station mark 400 feet. A limestone post 40 by 7 by 7 inches, set 40 inches in the ground. Aluminum bolt in center of top of post.

Resident referee: County clerk.

Magnetic declination, 3° 14′ E., September 28, 1899, at 6.30 a. m.

EVANSVILLE, VANDERBURG COUNTY.

Location of station: In grounds of the Willard Library, a few feet north of south fence.

Station mark: A limestone post 42 by 6 by 6 inches, set 40 inches in the ground, in the center of the top of which is cemented a bronze tablet. Reference marks: Southwest corner of library building N. 27° E., 173 feet distant. Southwest corner of grounds S. 48° W., 55 feet distant.

Distant mark: North of station mark 395 feet. A limestone post 28 by 6 by 6 inches, set 28 inches in the ground. Aluminum bolt in center of top of same. Reference marks: Northwest corner of grounds N. 84° W., 135 feet distant. Northwest corner of library building S. 48° E., 165 feet distant.

Resident referee: County clerk.

ARKANSAS.

Primary Traverse.

The following geographic positions were determined by Mr. George T. Hawkins by primary traverse in 1898, from the United States Coast and Geodetic Survey astronomic pier at Little Rock, Arkansas, along the St. Louis, Iron Mountain and Southern Railway to Texarkana, thence northward along the Kansas City, Pittsburg and Gulf Railroad to Black Fork triangulation station, established in 1887:

Geographic positions in Arkansas.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Little Rock astronomic pier	34 44 48.00	92 16 29.00
Ensign station	34 41 09.2	92 20 58.2
Mabelvale station	34 39 17.2	92 23 22.4
Quarter corner between secs. 3 and 10, T. 1 S., R. 13 W	34 39 16.8	92 23 25.7
Alexander station	34 37 48.0	92 26 41.6
Bryant station	34 35 37.3	92 29 25.5
Center sec. 34, T. 1 S., R. 14 W	34 35 26.6	92 29 29.7
Benton station	34 33 11.8	92 35 20.8
Corner secs. 10, 11, 14, and 15, T. 2 S., R. 15 W	34 33 25.1	92 35 24.5
Juniorsville station	34 30 52.7	92 37 41.4
Traskwood station	34 26 57.0	92 39 22.2
Center sec. 19, T. 3 S., R. 15 W	34 26 58.8	92 39 22.2
Gifford station	34 22 30.5	92 44 39.6
Perla station	34 22 07.4	92 46 59.5
Malvern station	34 21 52.1	92 48 55.4
Quarter corner between secs. 22 and 27, T. 4 S., R. 17 W	34 21 26.6	92 49 13.3
Etta station board	34 17 18.4	92 52 51.1
Saginaw Junction (Head Block)	34 16 34.9	92 53 27.5
Masons (station board)	34 16 15.0	92 53 44.2
Donaldson station	34 14 12.7	92 55 26.9
Center sec. 3, T. 6 S., R. 18 W	34 14 06.6	92 55 38.9
Witherspoon (station board)	34 09 44.8	92 59 11.2
Corner secs. 1, 2, 35, and 36, Ts. 6 and 7 S., R. 18 W	34 09 29.4	92 59 27.2
Dale Junction	34 07 17.5	93 02 31.8
Quarter corner between secs. 20 and 21, T. 7 S., R. 19 W	34 06 45.8	93 03 03.6
Arkadelphia station	34 06 48.8	93 03 12.3
Gum Spring station	34 03 48.8	93 05 28.3
Corner secs. 6, 7, 12, and 1, T. 8 S., Rs. 19 and 20 W	34 03 45.2	93 05 14.8
Quarter corner between secs. 25 and 36, T. 8 S., R. 20 W	33 59 49.0	93 05 53.2
Curtis station	33 59 43.9	93 05 56.0
Smithton station	33 56 31.6	93 07 52.7
Gurdon station	33 55 08.1	93 09 14.3
Corner secs. 1, 6, 7, and 12, T. 10 S., Rs. 20 and 21 W	33 53 24.5	93 11 46.4

Geographic positions in Arkansas—Continued.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Beirne station	33 53 16.9	93 12 18.4
Britts station	33 52 22.6	93 15 13.2
Clark-Nevada county line	33 51 42.7	93 17 55.5
Corner secs. 23, 24, 25, and 26, T. 10 S., R. 22 W.	33 50 59.2	93 19 14.3
Boughton station	33 50 57.7	93 19 34.3
Quarter corner between secs. 8 and 9, T. 11 S., R. 22 W	33 48 05.9	93 23 09.0
Prescott station	33 48 05.3	93 22 53.0
Emmet station	33 43 38.0	93 28 29.3
Corner secs. 3, 4, 9, and 10, T. 12 S., R. 23 W	33 43 23.1	93 28 32.6
Hope station	33 40 06.2	93 35 34.8
Corner secs. 28, 29, 32, and 33, T. 12 S., R. 24 W.	33 40 04.6	93 36 02.4
Guernsey station	33 38 32.7	93 40 43.9
Sheppard station	33 37 32.0	93 43 28.0
Sprudel station	33 36 58.1	93 46 02.4
Corner secs. 16, 17, 20, and 21, T. 13 S., R. 26 W.	33 36 53.0	93 48 41.0
Fulton station	33 36 41.6	93 48 51.3
Homan station	33 32 30.0	93 53 16.5
Mandeville station	33 28 51.4	93 57 50.6
Corner secs. 19, 20, 29, and 30, T. 15 S., R. 29 W.	33 25 48.3	94 01 50.0
State line in front of Texarkana station	33 25 08.6	94 02 36.3
Crossing Texas and Pacific and Kansas City, Pittsburg, and Gulf railroads	33 25 00.1	94 03 11.0
Texarkana (Trigg street) station	33 25 20.3	94 03 13.6
Red River bridge, south end	33 32 58.5	94 02 42.6
Ogden station	33 34 57.2	94 02 40.5
Corner secs. 23, 24, 25, and 26, T. 13 S., R. 29 W.	33 36 27.7	94 03 55.2
Hudson station	33 38 07.8	94 05 42.4
Ashdown	33 40 15.8	94 07 48.3
Choctaw Junction	33 40 25.8	94 07 58.1
Quarter corner between secs. 31 and 32, T. 12 S., R. 29 W	33 40 28.4	94 07 58.4
Rankin station	33 42 46.5	94 08 52.3
Wilton station	33 44 21.4	94 08 59.4
Corner secs. 6, 7, 12, and 1, T. 12 S., Rs. 29 and 30 W	33 44 26.2	94 08 50.7
Mistletoe station	33 45 48.1	94 13 15.3
Alleene station	33 46 21.2	94 15 34.3
Winthrop station	33 49 49.4	94 21 03.0
Corner Ts. 10 and 11 S., Rs. 21 and 22 W	33 50 01.6	94 21 17.6

Geographic positions in Arkansas—Continued.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Little River bridge, south end	33 53 31.7	94 23 09.2
Quarter corner between secs. 1 and 36, Ts. 9 and 10 S., R. 32 W	33 56 07.4	94 21 36.5
Horatio station	33 56 18.8	94 21 43.2
Dequeen station	34 02 11.4	94 20 14.3
Center sec. 30, T. 8 S., R. 31 W	34 02 15.1	94 20 21.0
Pullman road crossing	34 07 03.5	94 19 35.8
Quarter corner between secs. 8 and 9, T. 7 S., R. 31 W	34 10 07.3	94 18 51.8
Gillham station	34 10 05.1	94 19 00.0
Granniss station	34 14 20.9	94 20 11.3
Center sec. 18, T. 7 S., R. 31 W	34 14 27.8	94 20 26.4
Corner secs. 19, 20, 29, and 30, T. 5 S., R. 31 W	34 17 57.0	94 20 38.3
Wickes road crossing	34 18 03.4	94 20 20.7
Janssen station	34 22 45.5	94 22 02.3
Center sec. 25, T. 4 S., R. 32 W	34 22 46.9	94 22 13.8
Cove station	34 26 02.2	94 24 40.1
Hatfield station	34 29 08.3	94 22 47.3
Corner secs. 13, 14, 23, and 24, T 3 S., R. 32 W	34 29 20.3	94 22 36.8
Rust station	34 33 04.5	94 20 29.0
Mena station	34 34 55.6	94 14 11.5
Corner secs. 7, 8, 17, and 18, T. 2 S., R. 35 W	34 35 09.2	94 13 55.1
Acorn station	34 38 44.6	94 13 16.0
Rich Mountain station	34 41 23.1	94 21 20.5
Black Fork triangulation station	34 42 39.78	94 22 07.59

WISCONSIN.

Primary Traverse.

The following geographic positions were determined by Mr. George T. Hawkins, topographer, during the field season of 1899, by primary traverse between United States Coast and Geodetic Survey station insane asylum (near Madison) and the astronomic station of the United States lake survey near Valley Junction, and thence to the United States lake survey station Fort Howard (near Green Bay)

Geographic positions along or near the Chicago, Milwaukee and St. Paul Railway, from Madison to Vesper.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Madison Insane Asylum	43 08 00.13	89 23 48.29
Windsor station	43 13 08.5	89 20 21.6
Corner secs. 17, 18, 19, and 20, T. 9 N., R. 10 E.	43 14 19.6	89 20 32.9
Deforest station	43 14 46.4	89 20 24.7
Corner secs. 7, 8, 17, and 18, T. 9 N., R. 10 E.	43 15 11.6	89 20 33.4
Corner secs. 5, 6, 7, and 8, T. 9 N., R. 10 E.	43 16 03.9	89 20 36.0
Morrisonville station	43 16 38.4	89 21 25.6
Arlington station	43 20 18.3	89 22 33.8
Corner secs. 1, 2, 11, and 12, T. 10 N., R. 9 E.	43 21 10.2	89 22 48.1
Poynette station	43 23 40.5	89 23 52.4
Corner secs. 26, 27, 34, and 35, T. 11 N., R. 9 E.	43 23 46.2	89 24 01.7
Corner secs. 9, 10, 15, and 16, T. 11 N., R. 9 E.	43 26 23.2	89 25 15.4
Junction Madison Branch and main line, 2 miles east of Portage	43 32 19.0	89 26 02.3
Portage station	43 32 52.4	89 27 54.6
Corner secs. 1, 2, 35, and 36, Ts. 12 and 13 N., R. 8 E.	43 33 19.8	89 30 05.1
Corner secs. 29, 30, 31, and 32, T. 13 N., R. 8 E.	43 33 59.3	89 33 22.5
Hubbard station	43 34 05.1	89 34 06.5
Lewiston station	43 34 50.9	89 38 05.0
Cheng station	43 35 19.8	89 40 03.8
Sec. corner	43 37 37.1	89 46 33.7
Corner secs. 17, 18, 19, and 20, T. 13 N., R. 7 E.	43 35 54.9	89 41 48.4
Kilbourn station	43 37 38.4	89 46 30.4
Field station	43 39 49.0	89 48 59.7
Corner secs. 4, 5, 8, and 9, T. 14 N., R. 5 E.	43 42 50.7	89 53 44.9
Lyndon station	43 42 45.7	89 53 49.0
Corner secs. 30, 31, 36, and 25, T. 15 N., Rs. 4 and 5 E	43 44 46.5	89 57 09.4
Round Bluff station	43 45 08.9	89 57 58.9
Corner secs. 7, 18, 13, and 12, T. 15 N., Rs. 3 and 4 E	43 47 22.0	90 04 09.6
Corner secs. 5, 6, 7, and 8, T. 16 N., R. 3 E.	43 51 45.6	90 09 35.0
New Lisbon station	43 52 15.6	90 09 57.4
Quarter section corner, 2 miles southeast of Camp Douglas	43 54 07.6	90 13 44.5
Camp Douglas station	43 55 12.9	90 15 54.0
Camp Douglas Junction, Chicago and Northwestern and Chicago, Milwaukee and St. Paul railways	43 55 14.0	90 15 55.6

Geographic positions along or near the Chicago, Milwaukee and St. Paul Railway, from Madison to Vesper—Continued.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Corner secs. 1, 2, 35, and 36, Ts. 17 and 18 N., R. 1 E	43 58 56.6	90 19 48.1
Nicedah Junction	44 01 37.6	90 22 50.3
Valley Junction, crossing Chicago and Northwestern and Chicago, Milwaukee and St. Paul railways	44 03 14.3	90 24 38.3
Astronomical station at corner Ts. 18 and 19 N., Rs. 1 E. and 1 W	44 04 26.6	90 25 56.7
Norway station	44 07 25.1	90 19 42.0
Mather station	44 08 28.5	90 18 27.0
South corner secs. 31 and 32, T. 21 N., R. 3 E	44 14 57.1	90 10 46.1
Babcock, junction west of	44 17 51.4	90 07 19.2
Babcock station	44 18 05.9	90 06 26.9
Dexterville, crossing Green Bay and Western and Chicago, Milwaukee and St. Paul railroads	44 22 36.1	90 06 27.2
Quarter corner between secs. 14 and 23, T. 22 N., R. 3 E	44 22 48.1	90 06 25.4
Dexterville station	44 22 49.9	90 06 27.0
Pittsville Junction	44 25 05.4	90 06 24.2
Corner secs. 29, 30, 31, and 32, T. 23 N., R. 3 E	44 26 20.1	90 03 42.6
Hausen station	44 27 54.9	89 59 33.0
Vesper, crossing railways	44 29 19.1	89 58 06.4

Geographic positions along or near the Marshfield and Southeastern Railway, from Vesper to Marshfield.

Stations.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Corner secs. 2, 3, 34, and 36, Ts. 23 and 24 N., R. 4 E	44 30 42.8	90 00 08.1
Arpin station	44 32 31.2	90 02 01.9
Corner secs. 4½ miles southeast of Marshfield	44 36 43.1	90 06 28.6
Corner secs. 15, 16, 21, and 22, T. 25 N., R. 3 E	44 38 26.3	90 08 16.6
Marshfield station	44 40 02.0	90 10 15.2

Geographic positions along or near the Wisconsin Central Railway, from Marshfield to Chelsea.

[Spur traverse line.]

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Marshfield, junction west of	44 40 13.3	90 10 46.8
Corner Ts. 25 and 26 N., Rs. 2 and 3 E	44 41 07.8	90 11 47.0
Spencer station	44 45 23.8	90 17 41.9
Corner secs. 5, 6, 7, and 8, T. 26 N., R. 2 E	44 45 27.2	90 17 51.4
Romeo station	44 47 57.9	90 18 26.9
Unity station	44 51 08.8	90 18 51.8
Corner Ts. 27 and 28 N., Rs. 1 and 2 E	44 51 33.0	90 18 50.3
Colby station	44 54 33.9	90 18 50.8
Corner secs. 7, 8, 13, and 12, T. 28 N., Rs. 1 and 2 E	44 55 00.4	90 18 48.8
Junction at Abbotsford	44 56 47.2	90 19 05.7
Abbotsford station	44 56 51.6	90 19 06.9
Dorchester station	45 00 06.0	90 19 43.4
Corner secs. 13, 14, 23, and 24, T. 29 N., R. 1 E	45 00 12.1	90 20 01.2
Stetsonville station	45 04 29.7	90 18 48.7
Corner secs. 7, 8, 18, and 19, T. 30 N., R. 1 E	45 04 37.6	90 18 46.2
Medford station	45 08 15.7	90 20 35.4
Corner secs. 3, 4, 9, and 10, T. 31 N., R. 1 E	45 11 31.4	90 21 04.8
Whittlesey station	45 13 35.5	90 19 40.0
Corner secs. 1, 2, 11, and 12, T. 32 N., R. 1 E	45 16 45.5	90 18 38.3
Chelsea station	45 17 30.4	90 18 19.0

Geographic positions along or near the Chicago and Northwestern Railway, from Marshfield to New London Junction, by way of Wausau and Eland Junction.

Station.	Latitude.	Longitude
	° ′ ″	° ′ ″
Corner secs. 4, 5, 32, and 33, Ts. 25 and 26 N., R. 3 E	44 41 07.4	90 09 28.6
Corner secs. 8, 9, 16, and 17, T. 26 N., Rs. 3 E	44 44 35.5	90 09 30.8
Corner secs. 19, 30, 25, and 24, T. 27 N., Rs. 3 and 4 E	44 48 03.6	90 04 38.1
Stratford station	44 48 09.2	90 04 26.6
Corner secs. 3, 4, 33, and 34, Ts. 27 and 28 N., R. 4 E	44 51 31.6	90 01 22.3
Fenwood station	44 51 46.2	90 00 37.9
Edgar station	44 55 15.4	39 57 55.4
Corner secs. 7, 18, 13, and 12, T. 28 N., Rs. 4 and 5 E	44 54 58.8	89 57 43.8

Geographic positions along or near the Chicago and Northwestern Railway, from Marshfield to New London Junction, by way of Wausau and Eland Junction—Continued.

Station.	Latitude.			Longitude.		
	°	′	″	°	′	″
Corner secs. 1, 6, 7, and 12, T. 28 N., Rs. 5 and 6 E	44	55	50.5	89	50	34.8
Marathon station	44	55	53.3	89	50	29.5
Rib River station	44	56	15.1	89	46	30.3
Corner secs	44	57	07.0	89	40	28.1
Wausau station (new)	44	57	35.7	89	37	54.6
Wausau station (old)	44	57	18.5	89	37	38.4
Corner Ts. 28 and 29 N., Rs. 7 and 8 E	44	56	45.2	89	36	29.2
Kelly station	44	54	47.4	89	33	42.4
Corner secs	44	54	44.3	89	33	38.7
Corner secs	44	54	08.9	89	31	49.2
Callon station	44	53	55.1	89	30	21.8
Callon, road crossing at	44	53	53.8	89	30	12.5
Hatley station	44	53	18.7	89	20	17.2
Norrie station	44	53	12.1	89	15	27.2
Corner secs	44	53	08.1	89	15	11.6
Eland station	44	52	18.9	89	12	49.7
Eland Junction, headblock	44	52	16.9	89	12	47.9
Quarter corner between secs. 9 and 16, T. 27 N., R. 11 E	44	49	38.3	89	10	22.2
Wittenberg station	44	49	29.1	89	10	02.9
Whitcomb station	44	46	52.7	89	06	58.2
Tigerton station	44	44	32.6	89	03	36.3
Split Rock station	44	42	20.8	89	01	29.8
Big Falls Junction	44	41	08.5	88	58	27.3
Quarter corner south of sec. 31, T. 26 N., R. 13 E.	44	40	50.1	88	58	12.4
Hunting station	44	40	56.8	88	58	00.5
Marion station	44	40	10.0	88	52	56.9
Buckbee station	44	38	50.6	88	49	38.9
Corner secs. 22, 23, 26, and 27, T. 25 N., R. 14 E.	44	37	13.2	88	46	34.3
Clintonville station	44	36	59.9	88	45	37.2
Section corner 1 mile southeast of Clintonville.	44	36	21.5	88	44	43.5
Bear Creek station	44	31	51.7	88	43	29.7
Quarter corner between secs. 30 and 31, T. 24 N., R. 15 E	44	31	04.2	88	43	33.0
Sugarbush station	44	29	01.9	88	44	05.6
Corner Ts. 22 and 23 N., Rs. 14 and 15 E	44	24	47.4	88	44	06.5
New London Junction	44	23	45.7	88	44	04.4

Geographic positions along or near the Green Bay and Western Railroad from New London Junction to Fort Howard triangulation station.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Shiocton station	44 26 12.6	88 34 52.8
Corner secs. 21, 22, 27, and 28, T. 23 N., R. 16 E.	44 26 20.3	88 33 35.5
Corner secs. 16, 17, 8, and 9, T. 23 N., R. 17 E.	44 28 15.2	88 27 00.5
Black Creek station	44 28 22.4	88 26 54.6
Corner secs. 28, 29, 32, and 33, T. 24 N., R. 18 E.	44 30 43.9	88 19 46.8
Seymour station	44 30 33.4	88 19 39.9
Oneida station	44 29 58.6	88 11 31.1
Crossing Green Bay and Western and Chicago, Milwaukee and St. Paul railroads west of Green Bay	44 31 18.9	88 02 45.1
Fort Howard reference post	44 30 23.97	88 02 31.45
Fort Howard triangulation station	44 30 30.28	88 02 34.05

Geographic positions along or near the Chicago and Northwestern Railway from Eland Junction to Deerbrook.

[Spur traverse line.]

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Corner secs. 5, 6, 7, and 8, T. 28 N., R. 11 E.	44 55 44.5	89 12 14.5
Birnamwood station	44 55 52.4	89 12 22.2
Center sec. 7, T. 29 N., R. 11 E	45 00 29.5	89 12 42.8
Aniwa station	45 00 35.8	89 12 39.9
Corner secs. 20, 21, 28, and 29, T. 30 N., R. 11 E.	45 03 35.7	89 10 52.3
Elmhurst station	45 03 46.2	89 10 50.9
Corner secs. 3, 4, 9, and 10, T. 30 N., R. 11 E.	45 06 11.2	89 09 37.2
Antigo station	45 08 28.6	89 09 13.3
Junction 1½ miles north of Antigo	45 09 41.3	89 09 09.6
Corner secs. 5, 6, 31, and 32, Ts. 31 and 32, R. 11 E.	45 12 23.2	89 09 08.5
Deer Brook station	45 13 51.0	89 09 07.8
Corner secs. 19, 20, 29, and 30, T. 32 N., R. 11 E.	45 14 07.6	89 09 06.7

Meridian Marks.

ANTIGO, LANGLADE COUNTY.

Location of station: In southeast corner of grounds of county court-house, a few feet from south line of court-house grounds.

Station mark: A limestone post 36 by 9 by 9 inches, set 34 inches in the ground, in the center of the top of which is cemented a bronze tablet. Reference marks: East line of court-house grounds distant 17 feet. South line of court-house 4 feet distant.

Distant mark: 420 feet north of station, a limestone post 36 by 9 by 9 inches, set 34 inches in the ground. Aluminum bolt in center of top of same. Reference marks: North line of court-house grounds distant 3 feet. East line of court-house grounds distant 30 feet.

Resident referee: County clerk.

MAUSTON, JUNEAU COUNTY.

Location of station: A few feet north of sidewalk on south side of schoolhouse grounds.

Station mark: A limestone post 44 by 6 by 7 inches, set 42 inches in the ground, in the center of the top of which is cemented a bronze tablet. Reference marks: Door in east side of schoolhouse, N. 42° W., 237 feet distant. Bell on roof of jail, N. 22° E., 250 feet distant.

Distant mark: North of station 387 feet. A limestone post 28 by 6 by 6 inches, set 28 inches in the ground, in the center of the top of which is set an aluminum bolt. Reference marks: East wall of court-house is 5 feet west; southeast corner of court-house, 13 feet distant.

Resident referee: County clerk.

MEDFORD, TAYLOR COUNTY.

Location of station: In grounds of county court-house, a few feet northeast of court-house.

Station mark: A brown sandstone post 36 by 6 by 6 inches, set 36 inches in the ground, in the center of the top of which is cemented a bronze tablet. Reference marks: Northeast corner of court-house S. 72° W., 52 feet distant. Belfry on court-house S. 41° W., 70 feet distant.

Distant mark: North of station 369 feet. A brown sandstone post 30 by 6 by 6 inches, set 30 inches in the ground, with aluminum bolt in center of top of same. Distant mark is set between sidewalk and yard fence 15 feet west of gate and 24 feet from southwest corner of dwelling house.

Resident referee: County clerk.

PORTAGE, COLUMBIA COUNTY.

Location of station: In high school grounds, a few feet north of south line of grounds.

Station mark: A limestone post 42 by 5 by 10 inches, set 40 inches in the ground, in the center of the top of which is cemented a bronze tablet. Reference marks: Flag pole on schoolhouse N. 43° W., 200 feet distant. Cluster of trees N. 11° W., 96 feet distant.

Distant mark: North of station 321 feet. A limestone post 24 by 6 by 6 inches, set 24 inches in the ground, with aluminum bolt in center of top.

Resident referee: County clerk.

WAUSAU, MARATHON COUNTY.

Location of station: In grounds of the county court-house, a few feet from south fence line.

Station mark: A limestone post 42 by 7 by 7 inches, set 40 inches in the ground, in the center of the top of which is a bronze tablet. Reference marks: Marble statue N. 13° E., 42 feet distant. Cottonwood tree, 18 inches in diameter, N. 26° W., 36 feet distant.

Distant mark: 238 feet north of station. A limestone post 42 by 7 by 7 inches, set 38 inches in the ground, with an aluminum bolt in center of top of same. Reference mark: Northwest corner of grounds N. 80° W., 48 feet distant.

Resident referee: County clerk.

MINNESOTA.

Primary Traverse.

The following geographic positions were determined by Mr. George T. Hawkins by primary traverse during field season of 1898, starting from United States Coast and Geodetic Survey astronomic station in the grounds of the University of Minnesota, at Minneapolis. Traverse follows the main line of the Northern Pacific Railway to Itaska station and the main line of Canadian Pacific Railway to Hamel.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Minneapolis astronomic pier	44 58 37.72	93 14 12.68
Great Northern and Northern Pacific railways crossing	45 01 35.5	93 16 01.7
Fridley station	45 05 05.8	93 16 10.1
Quarter corner between secs. 13 and 14, T. 30 N., R. 24 W	45 05 09.3	93 16 02.8
Junction station	45 08 52.7	93 17 28.3
Coon Creek station	45 10 09.9	93 19 22.2
Quarter corner between secs. 9 and 16, T. 31 N., R. 24 W	45 10 58.1	93 20 13.6
Anoka station (Great Northern)	45 12 18.5	93 22 33.9
Corner secs. 27, 28, 33, and 34, T. 32 N., R. 25 W	45 13 31.1	93 26 55.9
Corner secs. 19, 20, 29, and 30, T. 32 N., R. 25 W	45 14 27.4	93 29 24.3
Itaska station	45 14 58.7	93 30 15.5
Great Northern and Canadian Pacific railways crossing	45 02 51.9	93 21 12.8
Crystal station	45 02 49.7	93 21 36.8
Corner secs. 5, 6, 7, and 8, T. 118 N., R. 21 W	45 03 02.8	93 22 46.0
Quarter corner between secs. 11 and 12, T. 118 N., Rs. 22 and 23 W	45 02 37.0	93 31 16.1
Hamel station	45 02 29.9	93 31 24.5

NORTH DAKOTA-MINNESOTA.

Primary Traverse.

The following geographic positions were determined by Mr. George T. Hawkins from primary traverse between the adjusted traverse positions of Farquar station and Sanborn as computed by him in 1896. Field work was completed in 1898 except for that part between Fargo, North Dakota, and Valley City, North Dakota, which was run by Mr. H. L. Baldwin, jr., in 1894, and from Valley City to Sanborn, which was run by Mr. George T. Hawkins in 1893.

This traverse is based upon the United States Geological Survey astronomic station at Jamestown, North Dakota, and the United States Boundary Commission astronomic station near Pembina, North Dakota.

Geographic positions along or near the Northern Pacific Railway from Farquar to Leeds.

Station.	Latitude.	Longitude.
NORTH DAKOTA.	° ′ ″	° ′ ″
Farquar station	47 23 36.0	99 04 51.3
Carrington	47 26 57.3	99 07 29.0
Junction Northern Pacific and Canadian Pacific railways, near Carrington	47 27 42.8	99 08 00.4
Corner Ts. 146 and 147 N., Rs. 66 and 67 W	47 30 02.9	99 08 08.4
Guptill station	47 30 57.7	99 08 06.6
Barlow	47 34 09.6	99 08 06.0
Corner Ts. 147 and 148 N., Rs. 66 and 67 W	47 35 16.1	99 08 07.6
Corner Ts. 148 and 149 N., Rs. 66 and 67 W	47 40 21.9	99 08 07.2
New Rockford station	47 40 48.8	99 08 04.8
Section corner 3 miles north of New Rockford and 200 feet east of railway	47 43 50.4	99 08 01.1
Sheyenne station	47 49 39.4	99 07 04.2
Corner secs. 4, 5, 8, and 9, T. 150 N., R. 66 W	47 49 56.2	99 07 23.6
Quarter corner between secs. 25 and 26, T. 151 N., R. 67 W	47 52 07.5	99 11 13.4
Southwest corner of section in which Oberon is located	47 55 10.2	99 12 31.5
Oberon station	47 55 22.9	99 12 10.0
Corner secs. 14, 15, 22, and 21, T. 152 N., R. 67 W	47 58 40.1	99 12 33.6
Lallie station	47 58 42.2	99 12 47.4
Minnewaukon station	48 04 16.9	99 14 58.0
Section corner one-half mile north of Minnewaukon	48 04 43.3	99 14 55.5
Quarter corner between secs. 20 and 29, T. 154 N., R. 67 W	48 08 12.2	99 17 40.4
Brinsmade station	48 10 48.7	99 19 11.2
Corner Ts. 154 and 155 N., Rs. 66 and 67 W	48 11 40.8	99 19 36.2
Corner secs. 15, 16, 21, and 22, T. 155 N., R. 68 W	48 14 16.9	99 23 30.1
Leeds station (Northern Pacific)	48 17 22.2	99 26 31.3

Geographic positions along or near the Great Northern Railway from Leeds to Grand Forks.

Station.	Latitude.	Longitude.
NORTH DAKOTA.	° ′ ″	° ′ ″
Leeds (junction Northern Pacific and Great Northern railways)	48 17 30.1	99 26 29.0
Leeds station (Great Northern)	48 17 27.9	99 26 11.6
Quarter corner 1 mile east of Leeds	48 17 19.2	99 24 48.8
Corner secs. 2, 3, 34, and 35, T. 155 N., R. 68 W.	48 16 53.5	99 22 11.9
Corner Ts. 155 and 156 N., Rs. 67 and 68 W.	48 16 53.3	99 19 35.6
Corner secs. 1, 6, 7, and 12, T. 155 N., Rs. 66 and 67 W.	48 16 01.3	99 11 49.2
Churchs Ferry station	48 16 04.4	99 11 34.4
Quarter corner between secs. 23 and 26, T. 155 N., R. 66 W.	48 13 51.2	99 06 38.6
Penn station	48 13 09.8	99 05 18.8
Center sec. 31, T. 155 N., R. 65 W.	48 12 32.8	99 04 02.7
Grand Harbor station	48 10 13.2	98 58 58.4
Corner secs. 10, 11, 14, and 15, T. 154 N., R. 65 W.	48 09 56.2	98 58 51.8
Corner secs. 13, 18, 19, and 24, T. 154 N., Rs. 64 and 65 W.	48 09 03.6	98 56 16.0
Devils Lake station	48 06 32.5	98 51 26.0
Crossing Great Northern Railway and range line between Rs. 63 and 64 W.	48 06 02.1	98 48 28.4
Corner secs. 2, 3, 10, and 11, T. 153 N., R. 63 W.	48 05 33.9	98 43 15.6
Quarter corner between secs. 16 and 17, T. 153 N., R. 62 W.	48 04 17.7	98 38 07.3
Crary station	48 04 12.9	98 38 05.6
Crossing Great Northern Railway and range line between Rs. 61 and 62 W.	48 03 23.6	98 32 59.2
Corner secs. 20, 21, 28, and 29, T. 153 N., R. 61 W.	48 02 59.5	98 30 19.7
Bartlett station	48 02 45.6	98 25 39.4
Quarter corner between secs. 25 and 30, T. 153 N., Rs. 60 and 61 W.	48 02 33.6	98 25 10.3
Lakota station	48 02 22.3	98 20 28.7
Crossing of Great Northern Railway and range line between Rs. 59 and 60 W.	48 02 08.1	98 17 23.0
Center sec. 30, T. 153 N., R. 59 W.	48 02 07.0	98 16 42.6
Quarter corner between secs. 33 and 34, T. 153 N., R. 59 W.	48 01 43.6	98 13 29.6
Mapes station	48 01 48.8	98 13 10.6
Quarter corner between secs. 31 and 36, T. 153 N., Rs. 58 and 59 W.	48 01 40.8	98 09 39.8

Geographic positions along or near the Great Northern Railway from Leeds to Grand Forks—Continued.

Station.	Latitude.	Longitude.
NORTH DAKOTA—continued.	° ′ ″	° ′ ″
Michigan station	48 01 24.5	98 07 08.1
North corner secs. 2 and 3, T. 152 N., R. 58 W	48 01 15.2	98 03 02.8
Corner T. 153 N., Rs. 57 and 58 W	48 01 15.0	98 01 48.4
Corner T. 152 N., Rs. 57 and 58 W	48 00 54.1	98 00 27.3
Petersburg station	48 00 46.2	97 59 50.3
Quarter corner between secs. 7 and 12, T. 152 N., Rs, 56 and 57 W	47 59 52.1	97 52 44.0
Niagara station	47 59 44.0	97 52 03.0
Quarter corner between secs. 25 and 30, T. 152 N., Rs. 55 and 56 W	47 57 17.2	97 45 01.1
Shawnee station	47 57 09.9	97 44 46.5
Quarter corner between secs. 2 and 3, T. 151 N., R. 55, W	47 55 31.2	97 39 49.0
Larimore switch block, at junction west of	47 55 26.2	97 39 42.3
Larimore station	47 54 12.2	97 37 20.9
Corner secs. 7, 18, 13, and 12, T. 151 N., Rs. 54 and 55 W	47 54 11.7	97 37 14.2
Arvilla station	47 55 08.0	97 29 48.7
Corner secs. 1, 6, 7, and 12, T. 151 N., Rs. 53 and 54 W	47 55 04.5	97 29 29.3
Emerado station	47 55 07.7	97 22 02.3
Corner secs. 1, 6, 7, and 12, T. 151 N., Rs. 52 and 53 W	47 55 05.9	97 21 43.5
Ojata station	47 55 07.0	97 16 02.6
Corner secs. 1, 6, 7, and 12, T. 151 N., Rs. 51 and 52 W	47 55 07.6	97 14 09.4
Grand Forks Junction, west end of Y	47 55 05.7	97 06 33.6
Corner secs. 1, 6, 7, and 12, T. 151 N., Rs. 50 and 51 W	47 55 04.3	97 06 23.3
University station	47 55 05.4	97 04 11.8
Grand Forks station	47 55 18.8	97 01 49.5
Grand Forks, middle of drawbridge	47 55 29.6	97 01 20.8

Geographic positions along or near the Northern Pacific Railway from Sanborn, North Dakota, to Moorhead, Minnesota.

Station.	Latitude.	Longitude.
NORTH DAKOTA.	° ′ ″	° ′ ″
Southwest corner sec. 21, T. 140 N., R. 58 W	46 55 07.5	98 00 59.3
Southwest corner sec. 22, T. 140 N., R. 57 W	46 55 06.4	97 52 13.2
Corner secs. 19, 30, 25, and 24, T. 140 N., Rs. 54 and 55 W	46 55 04.3	97 33 15.4
Casselton, crossing Northern Pacific and Great Northern railways	46 53 57.7	97 13 11.1
Southwest corner sec. 35, T. 140 N., R. 52 W	46 53 21.8	97 13 10.3
Corner Ts. 139 and 140 N., Rs. 50 and 51 W	46 53 24.1	97 03 03.8
Fargo (crossing of range line)	46 52 27.8	96 47 46.8
Fargo, crossing Northern Pacific Railway and Broadway	46 52 25.5	96 47 08.9
MINNESOTA.		
Moorhead, middle of drawbridge	46 52 24.2	96 46 26.6
Moorhead station (Northern Pacific)	46 52 24.1	96 45 57.2
Corner secs. 1, 6, 7, and 12, T. 139 N., Rs. 47 and 48 W	46 52 31.8	96 40 19.2

Geographic positions along or near the Great Northern Railway from Glyndon, Minnesota, to the astronomic station near Pembina, North Dakota.

Station.	Latitude.	Longitude.
MINNESOTA.	° ′ ″	° ′ ″
Glyndon, crossing Northern Pacific and Great Northern railways	46 52 22.1	96 34 50.1
Section corner in bottom 3 miles north of Glyndon and 160 feet west of railway	46 55 10.3	96 33 58.9
Averill station	46 58 00.2	96 32 48.0
Quarter corner between secs. 20 and 29, T. 141 N., R. 46 W	47 00 19.2	96 31 51.7
Felton station	47 04 35.5	96 30 17.9
Quarter corner between secs. 28 and 33, T. 142 N., R. 46 W	47 04 40.8	96 30 31.3
Quarter corner south of sec. 33, T. 143 N., R. 46 W	47 09 03.0	96 30 31.1
Borup station	47 10 45.7	96 30 18.1
Wheatville station	47 13 28.3	96 30 17.9
Quarter corner between secs. 16 and 21, T. 144 N., R. 46 W	47 16 52.4	96 30 24.4
Ada station	47 17 57.8	96 30 48.7

Geographic positions along or near the Great Northern Railway from Glyndon, Minnesota, to the astronomic station near Pembina, North Dakota—Continued.

Station.	Latitude.	Longitude.
MINNESOTA—continued.	° ′ ″	° ′ ″
Quarter corner between secs. 28 and 33, T. 145 N., R. 46 W	47 20 20.5	96 31 27.2
Quarter corner between secs. 29 and 32, T. 146 N., R. 46 W	47 25 34.1	96 32 44.0
Rolette station	47 27 46.6	96 32 30.3
South corner secs. 32 and 33, T. 147 N., R. 46 W.	47 29 55.6	96 32 11.7
Beltrami station	47 32 28.1	96 31 45.3
Corner secs. 4, 5, 32 and 33, Ts. 147 and 148 N., R. 46 W	47 35 08.3	96 32 02.5
Russia station	47 37 36.1	96 33 30.4
South corner secs. 31 and 32, T. 149 N., R. 46 W.	47 40 23.3	96 35 09.3
Kittson station	47 41 04.1	96 35 29.5
Corner secs. 13, 18, 19 and 24, T. 149 N., Rs. 46 and 47 W	47 42 59.9	96 36 27.0
Quarter corner between secs. 12 and 13, T. 149 N., R. 47 W	47 43 51.7	96 37 06.1
Carman station	47 45 36.6	96 37 00.7
Crookston station	47 46 30.5	96 36 18.5
Junction 1 mile north of Crookston	47 47 29.0	96 35 50.0
Quarter corner between secs. 19 and 24, T. 150 N., Rs. 46 and 47 W	47 47 52.5	96 36 27.1
Quarter corner between secs. 19 and 24, T. 150 N., Rs. 47 and 48 W	47 47 46.7	96 44 09.0
Fisher station	47 48 09.5	96 47 46.6
Quarter corner between secs. 15 and 16, T. 150 N., R. 48 W	47 48 39.0	96 48 01.9
Quarter corner between secs. 31 and 36, T. 151 N., Rs. 48 and 49 W	47 51 15.8	96 51 55.7
Malory station	47 52 35.0	96 54 29.4
Corner secs. 15, 16, 21, and 22, T. 151 N., R. 49 W	47 53 26.6	96 55 50.0
Corner secs. 1, 6, 7, and 12, T. 151 N., R. 49 and 50 W	47 55 09.3	96 59 42.2
East Grand Forks station (Great Northern)	47 55 34.1	97 00 42.1
Shirley station	47 52 10.0	96 36 38.2
Junction Great Northern and Northern Pacific on township line north of Shirley	47 56 03.1	96 37 18.4
Euclid station	47 58 21.6	96 38 05.1
Corner secs. 2, 3, 10, and 11, T. 152 N., R. 47 W	48 00 23.6	96 39 08.2

Geographic positions along or near the Great Northern Railway from Glyndon, Minnesota, to the astronomic station near Pembina, North Dakota—Continued.

Station.	Latitude.	Longitude.
MINNESOTA—continued.	° ′ ″	° ′ ″
Angus station	48 04 55.7	96 41 57.8
Corner secs. 4, 5, 32 and 33, Ts. 153 and 154 N., R. 47 W	48 06 28.2	96 42 46.8
Quarter corner between secs. 1 and 36, Ts. 154 and 155 N., R. 48 W	96 11 41.2	96 46 01.4
Warren station	96 11 43.2	96 46 01.9
Corner secs. 23, 24, 25, and 26, T. 155 N., R. 48 W	48 13 25.6	96 46 41.3
Crossing of Great Northern Railway and township line between Ts. 155 and 156 N	48 16 54.3	96 47 51.4
North corner secs. 3 and 4, T. 156 N., R. 48 W	48 22 10.3	96 49 21.6
Corner secs. 8, 9, 16, and 17, T. 157 N., R. 48 W	48 25 37.8	96 51 43.5
Quarter corner between secs. 4 and 5, T. 157 N., R. 48 W	48 26 55.2	96 51 44.0
Stephen station	48 27 01.8	96 52 05.8
Corner secs. 5, 6, 31, and 32, Ts. 158 and 159 N., R. 48 W	48 32 34.2	96 53 02.5
Donaldson station	48 34 22.6	96 53 31.0
Quarter corner between secs. 18 and 19, T. 159 N., R. 48 W	48 35 11.2	96 53 39.7
Kennedy station	48 38 31.4	96 54 15.5
Corner secs. 30, 31, 36, and 25, T. 160 N., Rs. 48 and 49 W	48 38 39.1	96 54 17.6
Corner secs. 19, 30, 25, and 24, T. 161 N., Rs. 48 and 49 W	48 44 43.9	96 55 27.9
Hallock station	48 46 23.4	96 56 26.3
Quarter corner between secs. 2 and 35, Ts. 161 and 162 N., R. 49 W	48 48 12.6	96 57 26.9
Quarter corner between secs. 21 and 22, T. 162 N., R. 49 W	48 50 22.8	96 59 25.5
Northcote station	48 50 39.7	96 59 42.7
Humboldt station	48 55 08.6	97 05 15.4
Corner secs. 1, 6, 7, and 12, T. 163 N., Rs. 50, and 51 W	48 57 46.1	96 11 13.6
Astronomical station near Pembina, North Dakota	49 00 00.0	96 13 51.5

ROCKY MOUNTAIN SECTION OF TOPOGRAPHY.

WYOMING.

The following positions are from work commenced in 1896 by Mr. W. S. Post, and continued in 1897–98 by Messrs. Frank Tweedy and T. M. Bannon:

There are two bases and two astronomic stations included in the scheme. The Ranchester base was measured in 1896 by Mr. S. S. Gannett, who also established an astronomic station at Sheridan. (See Eighteenth Annual Report, Appendix, page 183.) A check base was measured in 1898 near Jackson Lake, in the Teton Valley, Uinta County, by Mr. T. M. Bannon, and a connection made with the astronomic station established by the United States Coast and Geodetic Survey near the Lake Hotel in the Yellowstone National Park.

	Meters.
The length of the Teton base as determined from the Ranchester base is	7, 586. 24
Measured length	7, 586. 46
Difference	0. 22

or an error of $\frac{1}{34484}$.

Both bases were measured in the usual manner with a 300-foot steel tape, and are assumed to be equally accurate. No distribution of the above error was made.

The azimuth of the Teton base, as computed from Sheridan and checked at McCulloch, differed only 2.3″ from that observed. It was therefore not considered necessary to make any adjustment for the error.

The position of the Lake astronomic station as determined by—

	Latitude.	Longitude.
United States Coast and Geodetic Survey is	44° 33′ 16. 10″	110° 23′ 44. 31″
United States Geological Survey from Sheridan	44 33 26. 33	110 23 23. 52
Difference	10. 23	20. 79

It was assumed that all of this difference is due to station error, and that because of the great mass of mountains south and west of Sheridan the greater station error is at that point.

Since no exact methods are known for computing actual station errors, an arbitrary adjustment was made of the latitude and longitude by giving the Lake position a weight of twice that given the Sheridan position, and all Sheridan positions were corrected by subtracting 6.82″ from latitudes and adding 13.85″ to longitudes.

Triangulation Stations.

SHERIDAN ASTRONOMIC PIER, SHERIDAN COUNTY.

About 400 feet southeast of the Burlington station at Sheridan, established in 1896 by Mr. S. S. Gannett.

Latitude, 44° 48′ 31.10″. Longitude, 106° 56′ 45.21″, observed.
Latitude, 44° 48′ 24.28″. Longitude, 106° 56′ 59.06″, adjusted.

BECKTON, SHERIDAN COUNTY.

About 5 miles southeast of Beckton post-office, 8 miles west of Sheridan, near the road.

Station mark: Iron bench-mark post.

[Latitude, 44° 44′ 42.95″. Longitude, 107° 02′ 46.27″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Little Goose	9 47 27.58	189 45 32.79	4.3262848
Black Mountain	89 44 12.00	269 30 04.26	4.4231216
Freezeout	112 32 39.40	292 15 58.42	4.5285555
Soldier Creek	174 13 12.10	354 12 36.77	4.0388331
Sheridan	228 01 22.40	48 05 25.97	4.0095167

SOLDIER CREEK, SHERIDAN COUNTY.

On the divide between Soldier Creek and Tongue River, about 8 miles northwest of Sheridan.

Station mark: Iron bench-mark post.

[Latitude, 44° 50′ 35.40″. Longitude, 107° 03′ 36.42″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Black Mountain	66 33 49.88	246 20 16.74	4.4420372
Campbell	102 31 41.01	282 27 36.62	3.8917227
Freezeout	93 55 21.38	273 39 14.72	4.4794437
Columbus	109 34 15.35	289 20 08.69	4.4459607
Northwest base	127 38 17.70	307 30 36.10	4.2578409
Southeast base	131 35 39.47	311 30 55.88	4.0714273
Wolf Mountain	145 09 38.12	325 03 08.36	4.3255314
Beckton	354 12 36.77	174 13 12.10	4.0388331

LITTLE GOOSE, JOHNSON COUNTY.

Near boundary line of Sheridan and Johnson counties, southeast of the great bend of Little Goose Creek. It is near the road which leaves Hyattsville-Sheridan road at Tepee Creek.

Station mark: Rock cairn.

[Latitude, 44° 33′ 26.20″. Longitude, 107° 05′ 29.60″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Dome Lake..............	100 43 37.57	280 31 24.42	4.3700902
Black Mountain..........	132 11 13.56	311 59 02.00	4.4900241
Beckton.................	189 45 32.79	9 47 27.58	4.3262848
Sheridan	201 58 16.98	22 04 15.00	4.4757198

CAMPBELL, SHERIDAN COUNTY.

About 3 miles south of Hardin & Campbell's ranch, on Tongue River, on a low spur running toward Wolf Creek, 2 miles southeast of Bingham post-office.

Station mark: Iron bench-mark post.

[Latitude, 44° 51′ 30.02″. Longitude, 107° 09′ 22.92″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Black Mountain	54 24 15.21	234 14 46.12	4.3394273
Northwest base	144 13 56.76	324 10 19.69	4.0619894
Wolf Mountain	163 58 51.51	343 56 26.42	4.2123240
Southeast base...........	168 47 39.22	348 47 00.12	3.7960544
Soldier Creek............	282 27 36.62	102 31 41.01	3.8917227

RANCHESTER SOUTHEAST BASE, SHERIDAN COUNTY.

One-half mile west of Ranchester station, and 600 feet west of the water tank; on the embankment southwest of the track.

Station mark: A dressed stone 36 by 6 by 6 inches, set 30 inches in the ground.

[Latitude, 44° 54′ 48.71″. Longitude, 107° 10′ 18.31″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Black Mountain	41 16 21.69	221 07 31.38	4.3994241
Northwest base	120 15 29.37	300 12 31.33	3.8061176
Wolf Mountain	160 59 20.89	340 57 34.87	4.0038185
Soldier Creek	311 30 55.88	131 35 39.47	4.0714273
Campbell	348 47 00.12	168 47 39.22	3.7960544

CLOUD PEAK, JOHNSON-BIGHORN COUNTIES.

The highest peak of the Bighorn Mountains, on line between Johnson and Bighorn counties, accessible only from the southwestern side. A trail from Buffalo leads to a pass south of peak. There is also a trail up Paintrock Creek from Hyattsville.

Station mark: $\frac{\mathrm{U} \mid \mathrm{S}}{\mathrm{G} \mid \mathrm{S}}$ chiseled on a large bowlder, above which is a rock cairn 8 feet high.

[Latitude, 44° 22′ 58.62″. Longitude, 107° 10′ 21.00″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Dome Lake	144 59 34.60	324 50 46.81	4.4617156
Little Goose	198 21 47.26	18 25 11.42	4.3099325

NOTE.—Complete observations from this station were not obtained. The location is from an unclosed triangle and therefore subject to correction.

RED BLUFF, MONTANA.

In the Crow Indian Reservation, at the south end of the Rosebud Range, 1½ miles east of Owl Creek and 2 miles north of Wyoming-Montana line.

Station mark: Rock cairn.

[Latitude, 45° 02′ 14.37″. Longitude, 107° 11′ 29.19″.]

To station—	Azimuth.	Back Azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Freezeout	45 13 43.51	225 03 09.21	4.4434867
Wolf Mountain	22 20 02.86	202 19 06.85	3.6592016
Little Horn	96 36 04.70	276 25 58.70	4.2755643

WOLF MOUNTAIN, SHERIDAN COUNTY.

On the extreme western end of Wolf Mountain, near Wyoming-Montana line.

Station mark: Iron rod driven into the ground.

[Latitude, 44° 59′ 57.66″. Longitude, 107° 12′ 48.36″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Northwest base	19 30 47.64	199 29 35.51	3.8260442
Black Mountain	25 00 25.28	204 53 20.46	4.4960465
Freezeout	49 31 16.97	229 21 38.81	4.3734270
Columbus	60 29 17.08	240 21 39.31	4.2128224
Little Horn	110 34 40.33	290 25 30.55	4.2591820
Red Bluff	202 19 06.85	22 20 02.86	3.6592016
Soldier Creek	325 03 08.36	145 09 38.12	4.3255314
Southeast base	340 57 34.87	160 59 20.89	4.0038185
Campbell	343 56 26.42	163 58 51.51	4.2123240

RANCHESTER NORTHWEST BASE, SHERIDAN COUNTY.

One thousand three hundred and fifty feet beyond the northwest extremity of the first tangent west of Ranchester station, Burlington and Missouri River Railroad.

Station mark: A dressed stone, 36 by 6 by 6 inches, set 30 inches in the ground.

Reference mark: United States Geological Survey iron post set at right angles to base line (southwest), at a distance of 129 feet.

[Latitude, 44° 56′ 33.08″. Longitude, 107° 14′ 30.41″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Freezeout	60 08 46.09	240 00 20.25	4.2586049
Columbus	81 46 16.70	261 39 51.24	4.0824964
Wolf Mountain	199 29 35.51	19 30 47.64	3.8260442
Southeast base	300 12 31.33	120 15 29.37	3.8061176
Soldier Creek	307 30 36.10	127 38 17.70	4.2578409
Campbell	324 10 19.69	144 13 56.76	4.0619894

BLACK MOUNTAIN, SHERIDAN COUNTY.

A prominent peak locally well known, 10 miles southwest of Dayton.

Station mark: Copper bolt in solid rock, above which a rock cairn was erected.

[Latitude, 44° 44′ 37.24″. Longitude, 107° 22′ 50.50″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Dome Lake	00 16 50.45	180 16 47.89	4.2145907
Hunt	86 51 41.41	266 35 50.47	4.4738384
Medicine	101 28 17.04	281 06 17.79	4.6231224
Freezeout	159 59 21.07	339 56 48.52	4.1426676
Wolf Mountain	204 53 20.46	25 00 25.28	4.4960465
Southeast base	221 07 31.38	41 16 21.69	4.3994241
Campbell	234 14 46.12	54 24 15.21	4.3394273
Soldier Creek	246 20 16.74	66 33 49.88	4.4420372
Sheridan	258 13 41.99	78 31 53.76	4.5415021
Beckton	269 30 04.26	89 44 12.00	4.4231216
Little Goose	311 59 02.00	132 11 13.56	4.4900241

DOME LAKE, SHERIDAN-BIGHORN COUNTIES.

On boundary line between Sheridan and Bighorn counties, at the head of drainage of Shell Creek, South Fork of Tongue River and Big Goose Creek.

Station mark: Copper bolt in solid rock, above which a rock cairn was erected.

[Latitude, 44° 35′ 46.26″. Longitude, 107° 22′ 54.14″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Basin	55 55 48.89	236 31 35.96	4.7391352
McDonald	88 48 37.55	268 19 02.50	4.7465353
Hunt	116 27 52.03	296 12 04.88	4.5200893
Freezeout	170 58 52.34	350 56 22.55	4.4743490
Black Mountain	180 16 47.89	16 50.45	4.2145907
Little Goose	280 31 24.42	100 43 37.57	4.3700902

COLUMBUS, SHERIDAN COUNTY.

A sharp-pointed peak at base of Bighorn Mountains, between Columbus and Twin Creeks, 3½ miles southwest of Parkman. The Dayton-Bald Mountain road passes one-half mile to the west of the peak.

Station mark: Iron bench-mark post.

[Latitude, 44° 55′ 36.65″. Longitude, 107° 23′ 36.15″.]

To station—	Azimuth.			Back azimuth.			Log. distance.
	°	′	″	°	′	″	*Meters.*
Little Horn	168	53	43.52	348	52	12.09	4.1671370
Wolf Mountain	240	21	39.31	60	29	17.08	4.2128224
Soldier Creek	289	20	08.69	109	34	15.35	4.4459607
Northwest base	261	39	51.24	81	46	16.70	4.0824964

LITTLE HORN, MONTANA.

In Crow Indian Reservation, on a grassy butte between Little Horn and Pass creeks, 3½ miles southwest of old stage station and about 2 miles north of Wyoming-Montana line.

[Latitude, 45° 03′ 23.72″. Longitude, 107° 25′ 45.49″.]

To station—	Azimuth.			Back azimuth.			Log. distance.
	°	′	″	°	′	″	*Meters.*
Red Bluff	276	25	58.70	96	36	04.70	4.2755643
Wolf Mountain	290	25	30.55	110	34	40.33	4.2591820
Columbus	348	52	12.09	168	53	43.52	4.1671370
Freezeout	2	24	03.01	182	23	33.69	4.3373367

FREEZEOUT, SHERIDAN COUNTY.

On a large limestone rock about 3 miles north of Rockwood, just south of road to Bald Mountain from Dayton, 1 mile beyond top of grade.

Station mark: A large pine tree with rocks piled around it.

[Latitude, 44° 51′ 39.96″. Longitude, 107° 26′ 26.98″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Hunt	59 30 43.63	239 17 24.23	4.4619714
Medicine	82 35 59.51	262 16 31.53	4.5646473
Little Horn	182 23 33.69	2 24 03.01	4.3373367
Wolf Mountain	229 21 38.81	49 31 16.97	4.3734270
Red Bluff	225 03 09.21	45 13 43.51	4.4434866
Northwest base	240 00 20.25	60 08 46.09	4.2586049
Soldier Creek	273 39 14.72	93 55 21.38	4.4794437
Beckton	292 15 58.42	112 32 39.40	4.5285555
Black Mountain	339 56 48.52	159 59 21.07	4.1426676
Dome Lake	350 56 22.55	170 58 52.34	4.4743490

HUNT, BIGHORN COUNTY.

About 5 miles south of Bald Mountain City, on a limestone cliff facing northwest. It is the highest ground in the vicinity.

Station mark: Copper bolt in the solid rock, above which is a rock cairn 8 feet in diameter.

[Latitude, 44° 43′ 42.21″. Longitude, 107° 45′ 21.52″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Basin	19 47 24.99	199 38 55.24	4.6773313
McDonald	58 23 04.75	238 09 14.66	4.4856231
Lovell	100 41 02.45	280 19 48.56	4.6070637
Medicine	130 53 19.52	310 47 11.98	4.1808806
Freezeout	239 17 24.23	59 30 43.63	4.4619714
Black Mountain	266 35 50.47	86 51 41.41	4.4738382
Dome Lake	296 12 04.88	116 27 52.03	4.5200893

MEDICINE, BIGHORN COUNTY.

A locally well-known mountain, about 3 miles northwest of Bald Mountain.

Station mark: Rock cairn.

[Latitude, 44° 49′ 03.49″. Longitude, 107° 54′ 03.37″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
McDonald	29 13 31.40	209 05 47.73	4.4739547
Lovell	84 59 51.23	264 44 44.10	4.4533245
Freezeout	262 16 31.53	82 35 59.51	4.5646471
Black Mountain	281 06 17.79	101 28 17.04	4.6231223
Hunt	310 47 11.98	130 53 19.52	4.1808806

BASIN, BIGHORN COUNTY.

About 4 miles southeast of Basin City post-office, on a low rim rock forming the south margin of a bad-land gulch which empties into the Bighorn River about 1 mile south of Basin City, 3 miles northeast of the junction of No Wood Creek and Bighorn River.

Station mark: Iron bolt driven in sand rock, above which is a rock cairn 4 feet in diameter and 4 feet in height.

[Latitude, 44° 19′ 31.47″. Longitude, 107° 57′ 28.41″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Table	115 26 50.42	295 09 24.95	4.5632358
McDonald	160 45 27.42	340 40 09.38	4.4828203
Hunt	199 38 55.24	19 47 24.99	4.6773313
Dome Lake	236 31 35.96	56 55 48.89	4.7391352
Dorsey	62 01 23.62	241 49 31.57	4.4088926
Tatman	87 20 45.75	266 59 30.00	4.6076162

M'DONALD, BIGHORN COUNTY.

About 4 miles southeast of McDonald post-office, on a hogback ridge. The McDonald-Shell Creek road runs parallel to hogback about 1 mile to the northeast.

Station mark: An iron rod driven into the rock, above which a rock cairn was erected.

[Latitude, 44° 35′ 00.96″. Longitude, 108° 05′ 02.52″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	Meters.
Table	60 29 10.95	240 17 01.52	4.4219541
Dry	92 44 41.98	272 29 24.91	4.4600503
Lovell	149 33 06.94	329 25 45.25	4.4352092
Medicine	209 05 47.73	29 13 31.40	4.4739547
Hunt	238 09 14.66	58 23 04.75	4.4856231
Dome Lake	268 19 02.50	88 48 37.55	4.7465353
Basin	340 40 09.38	160 45 27.42	4.4828203

DORSEY, BIGHORN COUNTY.

On the highest point of a red, bad-land peak about 12 miles south of Otto and about 14 miles west of the junction of the Bighorn River and No Wood Creek; 4 miles north of Fifteenmile Creek.

Station mark: Copper bolt sunk into a sandstone rock.

Reference mark: $\frac{\text{U} \mid \text{S}}{\text{G} \mid \text{S}}$ chiseled on a rock buried flush with ground, 20.60 feet south of station.

[Latitude, 44° 13′ 00.54″. Longitude, 108° 14′ 28.43″.

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	Meters.
Basin	241 49 31.57	62 01 23.62	4.4088926
Squaw	66 10 29.43	245 56 32.04	4.4656453
Fenton	101 06 05.07	280 50 58.20	4.4680179
Tatman	119 27 27.46	299 18 04.91	4.3121056
Table	159 16 30.69	339 10 59.18	4.4716690

LOVELL, BIGHORN COUNTY.

About 10 miles southeast of Lovell post-office (Cook's store), on a sharp anticline, which continues southward across the Bighorn River, and on which McDonald triangulation station is also situated. The Lovell-McDonald stage road runs about 2 miles west of the station.

Station mark: Iron bench-mark post.

[Latitude, 44° 47′ 41.25″. Longitude, 108° 15′ 30.55″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Table	14 00 29.23	193 55 39.67	4.5756282
Dry	34 03 09.04	213 55 12.00	4.4267549
Sage	103 44 27.61	283 24 42.73	4.5794653
Medicine	264 44 44.10	84 59 51.23	4.4533245
Hunt	280 19 48.56	100 41 02.45	4.6070637
McDonald	329 25 45.25	149 33 06.94	4.4352092

TABLE, BIGHORN COUNTY.

On the south edge and one-fourth mile east of the west end of the long table mountain between Otto and Burlington, on the north side of the Grey Bull River, 9 miles northwest of Otto, 3 miles northeast of Burlington. The main stage road passes one-half mile south of station.

Station mark: A long iron rod driven into the ground, over which is placed a stone with a copper bolt sunk into it.

Reference mark: "U.S.G.S." chiseled on a stone buried flush with the ground, 24.90 feet northwest of station.

[Latitude, 44° 27′ 57.97″. Longitude, 108° 22′ 22.72″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
McCulloch	109 44 39.58	289 24 31.48	4.6061020
Sage	148 32 21.60	328 17 29.90	4.7270543
Dry	157 47 39.47	337 44 32.86	4.1911223
Lovell	193 55 39.67	14 00 29.23	4.5756282
McDonald	240 17 01.52	60 29 10.95	4.4219541
Basin	295 09 24.95	115 26 50.42	4.5632358
Dorsey	339 10 59.18	159 16 30.69	4.4716690
Tatman	22 38 09.08	202 34 17.04	4.2810851
Mesa	69 05 04.78	248 55 04.69	4.3076182

DRY, BIGHORN COUNTY.

Ten miles north of Table triangulation station, on the divide between Dry Creek and Stinkingwater. Bad lands to the north, gently sloping ground south.

Station mark: None.

[Latitude, 44° 35′ 43.63″. Longitude, 108° 26′ 48.80″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
McCulloch	88 38 02.31	268 20 59.66	4.5070486
Sage	144 43 43.88	324 31 58.46	4.5808790
Lovell	213 55 12.00	34 03 09.04	4.4267549
McDonald	272 29 24.91	92 44 41.98	4.4600503
Table	337 44 32.86	151 47 39.47	4.1911223

TATMAN, BIGHORN COUNTY.

On the east end of Tatman Hills, 10 miles southwest of Otto, 10 miles south of Burlington post-office. A cattle train leads from Tatman's ranch, on the Grey Bull River, south to a pass in the hills or mountains one-fourth mile west of station. Several alkali springs are on the south slope of the hill, about 200 yards from station.

Station mark: Cross chiseled on a rock, which is buried 2 feet below the surface of the ground, under a large dirt and rock monument.

Reference mark: An iron bench-mark post, set 2 feet in the ground, 8.09 feet south of station.

[Latitude, 44° 18′ 26.64″. Longitude, 108° 27′ 54.23″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Basin	266 59 30.00	87 20 45.73	4.6076162
Squaw	21 53 08.97	201 48 32.91	4.3732480
Fenton	67 49 42.33	247 43 57.53	4.0728410
Mesa	131 43 30.09	311 37 22.75	4.1925441
Table	202 34 17.04	22 38 09.08	4.2810851
Dorsey	299 18 04.91	119 27 27.46	4.3121056

SQUAW, BIGHORN COUNTY.

The larger or western one of two buttes, locally known as "Squaw Teats," in the bad lands near the head of Fifteenmile Creek, 6 miles south of the alkali springs on Fifteenmile Creek. A round-up road leaves the settlement on the Grey Bull near Charles Dodge's ranch and goes up Long Hollow to the head of a branch of Fifteenmile Creek, and then down that creek to the springs.

Station mark: Copper bolt sunk into a large bowlder under a rock monument.

Reference mark: $\frac{U \mid S}{G \mid S}$ chiseled on rock 13.20 feet south of station.

[Latitude, 44° 06′ 36.39″. Longitude, 108° 34′ 30.32″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Franks Peak	75 12 00.96	254 40 12.39	4.8014691
Marquette	108 26 49.24	287 58 11.09	4.7605901
Wise	113 42 57.94	293 23 03.10	4.6184007
Elk	134 25 31.15	314 10 57.01	4.5894892
Fenton	172 54 28.31	352 53 20.08	4.2451364
Tatman	201 48 32.91	21 53 08.97	4.3732480
Dorsey	245 56 32.04	66 10 29.43	4.4656453

FENTON, BIGHORN COUNTY.

A sharp, gravelly hill in the bad lands 1 mile southwest of the Tatman Hills, about 8 miles south of Fenton post-office, on Grey Bull River.

Station mark: Copper plug sunk into the rock under a rock monument.

[Latitude, 44° 16′ 01.74″. Longitude, 108° 36′ 08.21″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cedar	119 23 35.11	298 59 50.01	4.7132064
McCulloch	150 58 21.09	330 47 52.98	4.6105416
Mesa	177 17 42.76	357 17 20.63	4.1716427
Tatman	247 43 57.53	67 49 42.33	4.0728410
Dorsey	280 50 58.20	101 06 05.07	4.4680179
Squaw	352 53 20.08	172 54 28.31	4.2451364
Wise	88 47 26.80	268 28 38.60	4.5546437
Elk	110 50 45.27	290 37 18.27	4.4373627

MESA, BIGHORN COUNTY.

On the south edge of the table-land north of the Grey Bull River about 4 miles west of Fenton post-office. The main stage road up the Grey Bull Valley passes about one-half mile south of station.

Station mark: Copper bolt sunk into a large stone buried under a 3-foot rock cairn.

Reference mark: $\frac{\text{U} \mid \text{S}}{\text{G} \mid \text{S}}$ chiseled on rock buried flush with ground 20.17 feet northwest of bolt.

[Latitude, 44° 24′ 02.23″. Longitude, 108° 36′ 39.87″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
McCulloch	137 29 39.20	317 19 32.54	4.4511538
Table	248 55 04.69	69 05 04.78	4.3076182
Fenton	357 17 20.63	177 17 42.76	4.1716427
Tatman	311 37 22.75	131 43 30.09	4.1925441

SAGE, BIGHORN COUNTY.

On the eastern extremity of a long mesa, which lies nearly parallel to Stinkingwater River, between the Red Lodge-Corbett road on the west and Sage Creek on the east. It is about 8 miles west of Fannie post-office, on Sage Creek.

Station mark: A rock cairn.

[Latitude, 44° 52′ 30.02″. Longitude, 108° 43′ 31.04″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
McCulloch	17 26 32.67	197 21 12.85	4.5242764
Lovell	283 24 42.73	103 44 27.61	4.5794658
Dry	324 31 58.46	144 43 43.88	4.5808790
Table	328 17 29.90	148 32 21.60	4.7270543

M'CULLOCH, BIGHORN COUNTY.

On the highest part of the divide between Dry Creek and the Stinkingwater River, 6 miles east of Corbett post-office, 2 miles northwest of the peak known as McCulloch Peak, 2 miles southeast of a bad-land peak.

Station mark: Iron bench-mark post of the United States Geological Survey, set under a large dirt and rock monument.

Reference mark: Cross (+) cut on top of rock having U. S. cut on north side, 45.33 feet northeast of station.

[Latitude, 44° 35′ 16.24″. Longitude, 108° 51′ 05.46″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cedar	67 35 55.13	247 22 35.33	4.4353354
Trout Peak	91 54 28.33	271 26 09.23	4.7275183
Heart Mountain	112 26 55.26	292 15 41.90	4.3588121
Sage	197 21 12.85	17 26 32.67	4.5242764
Dry	268 20 59.66	88 38 02.31	4.5070486
Table	289 24 31.48	109 44 39.58	4.6061020
Mesa	317 19 32.54	137 29 30.20	4.4511538
Fenton	330 47 52.98	150 58 21.09	4.6105416

ELK, UINTA COUNTY.

On the west end of "Elk Mountain," in Dry Creek Basin, 5 miles from Frost ranch, on Sage Creek, 12 miles from Dodge ranch, on Grey Bull River. The road connecting these two ranches, known as the Charlie Dodge road, passes 1 mile south of hill.

Station mark: Copper bolt sunk into a large stone buried flush with the ground under a 5-foot monument.

Reference point: $\begin{array}{c|c} \mathrm{U} & \mathrm{S} \\ \mathrm{G} & \mathrm{S} \end{array}$ chiseled on a rock buried flush with the ground 15.08 feet northeast of bolt.

[Latitude, 44° 21′ 15.74″. Longitude, 108° 55′ 23.41″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Wise	44 08 55.72	224 03 33.58	4.1669415
Cedar	128 33 43.35	308 23 25.78	4.3967036
McCulloch	192 22 09.24	12 25 09.95	4.4242691
Fenton	290 37 18.27	110 50 45.27	4.4373627
Squaw	314 10 57.01	134 25 31.15	4.5894892

WISE, BIGHORN COUNTY.

On a small hill on the Meeteetse River, about 8 miles south of Frost Ranch on Stage Creek, 4 miles north of Wise post-office on Meeteetse Creek, about 500 feet east of Meeteetse-Red Lodge stage road, and about one-fourth mile northeast of the intersection of that road with a road leading to a sawmill on Meeteetse Creek.

Station mark: Copper bolt sunk into solid rock, over which is centered a large rock monument.

[Latitude, 44° 15′ 34.05″. Longitude, 109° 03′ 04.59″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Fenton	268 28 38.59	88 47 26.80	4.5546437
Squaw	293 23 03.10	113 42 57.94	4.6184007
Franks Peak	34 51 30.12	214 39 32.23	4.6045327
Marquette	94 55 01.44	274 46 17.59	4.2228535
Cedar	160 21 21.38	340 16 26.88	4.4420796
Elk	224 03 33.58	44 08 55.72	4.1669415

HEART MOUNTAIN, BIGHORN COUNTY.

A prominent isolated limestone peak, about 8 miles north of Cody, 10 miles northwest of Corbett.

Station mark: Copper bolt sunk into the limestone rock, over which is centered a large rock monument.

[Latitude, 44° 39′ 57.75″. Longitude, 109° 07′ 03.98″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	′ ° ″	*Meters.*
Cedar	11 51 26.62	191 49 19.08	4.2908799
Trout Peak	77 39 33.14	257 22 26.33	4.5184114
McCulloch	292 15 41.90	112 26 55.26	4.3588121

CEDAR, BIGHORN COUNTY.

An isolated mountain, separated from the south end of Rattlesnake Mountain by the canyon of the Stinkingwater River. The mountain is about 1 mile southeast of the junction of the north and south forks of the Stinkingwater River and 4 miles west of Cody post-office. The station is on the highest or western point.

Station mark: A copper bolt sunk into a large rock, which is centered under a rock monument.

[Latitude, 44° 29′ 38.25″. Longitude, 109° 10′ 05.68″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Trout Peak	113 07 27.67	292 52 29.88	4.4869743
Heart Mountain	191 49 19.08	11 51 26.62	4.2908799
McCulloch	247 22 35.33	67 35 55.13	4.4353354
Marquette	16 30 44.31	196 26 53.91	4.4099739
Fenton	298 59 50.01	119 23 35.11	4.7132064
Elk	308 23 25.78	128 33 43.35	4.3967036
Wise	340 16 26.88	160 21 21.38	4.4420796

MARQUETTE, BIGHORN COUNTY.

A high, round, grass-topped hill on the divide between the South Fork of the Stinkingwater and Grey Bull rivers, at the head of Belknap, Carter, and Meeteetse creeks. About 8 miles south of Marquette post-office and 15 miles northwest of Wise post-office. There is a sawmill about 6 miles east of station.

Station mark: A large rock monument.

[Latitude, 44° 16′ 19.76″. Longitude, 109° 15′ 35.08″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Trout Peak	150 15 02.12	330 03 56.71	4.6257012
Cedar	196 26 53.91	16 30 44.31	4.4099739
Wise	274 46 17.59	94 55 01.44	4.2228535
Squaw	287 58 11.09	108 26 49.24	4.7605901

FRANKS PEAK, BIGHORN COUNTY.

The highest peak on the divide between Grey Bull and Wood rivers, at the head of Wiggins (or Jack) and Franks creeks. About 12 miles southwest from Colonel Pickett's ranch on the Grey Bull River. There are three good trails from the Grey Bull Valley to the Chicago tunnel at the foot of the peak on the head of Wiggins Creek; the best and the one used by the mine people, starts in at Anderson's ranch and goes up Wiggins Creek.

Station mark: Copper bolt sunk into a large stone centered under a rock monument.

[Latitude, 43° 57′ 43.25″. Longitude, 109° 20′ 15.94″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Wise	214 39 32.23	34 51 30.12	4.6045327
Marquette	190 14 40.64	10 17 56.17	4.5443432
Younts	93 17 24.58	272 55 26.74	4.6270432
Pickett	167 35 58.67	347 32 58.12	4.4287274
Squaw	254 40 12.39	75 12 00.96	4.8014691

PICKETT, BIGHORN COUNTY.

On the high divide between the South Fork of the Stinkingwater and the Grey Bull rivers, at the heads of Belknap and Rock creeks, 8 miles northwest of Colonel Pickett's ranch, on the Grey Bull River.

Station mark: $\frac{\mathrm{U} \mid \mathrm{S}}{\mathrm{G} \mid \mathrm{S}}$ chiseled on a large rock set under a stone monument.

[Latitude, 44° 11′ 52.38″. Longitude, 109° 24′ 35.47″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Marquette	235 24 42.35	55 30 59.34	4.1630822
Franks Peak	347 32 58.12	167 35 58.67	4.4287274
Younts	56 53 33.58	236 34 33.50	4.6394095

TROUT PEAK, BIGHORN COUNTY.

One of the highest peaks in the Absaroka Range, at the head of Dead Indian and Trout creeks, 12 miles north of Nuckol's ranch, on the South Fork of the Stinkingwater River. Nuckol's ranch is about 25 miles west of Cody. A blazed cattle trail leads from the ranch to Trout Creek Basin, which is at the south foot of the peak.

Station mark: A copper bolt sunk into solid rock under a 6-foot rock monument.

[Latitude, 44° 36′ 06.71″. Longitude, 109° 31′ 25.46″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Table	51 24 29.35	231 02 13.29	4.7332788
Schurz	56 41 01.41	236 18 04.00	4.7169566
Heart Mountain	257 22 26.33	77 39 33.14	4.5184114
McCulloch	271 26 09.23	91 54 28.33	4.7275183
Cedar	292 52 29.88	113 07 27.67	4.4869743
Marquette	330 03 56.71	150 15 02.11	4.6257012

ISHAWOOA, YELLOWSTONE PARK TIMBER RESERVE.

A high cone-shaped peak on divide between the Yellowstone River and South Fork of the Stinkingwater River, at the heads of Ishawooa, Pass, and Mountain creeks. The Ishawooa trail passes about one mile south of peak.

Station mark: A copper bolt sunk into a large rock, which is centered under a 6-foot rock monument.

[Latitude, 44° 13′ 29.74″. Longitude, 109° 48′ 43.36″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Younts	8 58 05.11	188 55 52.46	4.4353423
Sheridan	94 54 58.01	274 25 00.02	4.7586216
Table	112 35 27.20	292 25 20.03	4.3198873

YOUNTS, BIGHORN COUNTY.

A high volcanic peak at the extreme head of the Upper Yellowstone River, between the alpine forks of that stream and 1½ miles north of the Continental Divide.

Station mark: A copper bolt sunk into a large rock, which is centered under a 6-foot rock monument.

[Latitude, 43° 58′ 57.65″. Longitude, 109° 51′ 53.94″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Sheridan	120 59 50.28	300 32 08.91	4.7905724
Table	156 40 36.41	336 32 43.28	4.5802150
Ishawooa	188 55 52.46	8 58 05.11	4.4353423
Pickett	236 34 33.50	56 53 33.58	4.6394095
Franks Peak	272 55 26.74	93 17 24.59	4.6270432
Breccia	37 56 39.56	217 47 59.23	4.4360462
Mount Leidy	56 50 55.72	236 28 30.00	4.7153635
Gravel	81 10 05.28	260 49 21.71	4.6068613

TABLE, YELLOWSTONE NATIONAL PARK.

A flat-topped mountain on ridge between Trapper and Mountain creeks; about 4 miles east of Yellowstone River.

Station mark: A copper bolt sunk into solid rock under a large rock monument.

[Latitude, 44° 17′ 48.78″. Longitude, 110° 03′ 13.30″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Sheridan	85 08 20.33	264 48 28.59	4.5797046
Trout Peak	231 02 13.29	51 24 29.35	4.7332788
Younts	336 32 43.28	156 40 36.40	4.5802150

SCHURZ, YELLOWSTONE NATIONAL PARK.

A high mountain on divide between the Yellowstone and North Fork of the Stinkingwater rivers, at the head of Trapper Creek. A trail leads up on the north slope of Trapper Creek from the Yellowstone River to the foot of the peak.

Station mark: A copper bolt sunk into solid rock under a 6-foot rock monument.

[Latitude, 44° 20′ 34.64″. Longitude, 110° 04′ 11.52″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Sheridan	77 08 31.68	256 49 20.13	4.5740975
Lake Astronomic Station	132 51 23.79	312 37 55.46	4.5409748
Trout Peak	236 18 04.00	56 41 01.41	4.7169566
Table	345 51 04.42	165 51 45.09	3.7225947

BRECCIA, UINTA COUNTY.

On a volcanic breccia ridge, about 2½ miles northeast of Twogwotee Pass, at the head of Blackrock Creek.

Station mark: $\overset{\text{U.S.G.S.}}{\Delta}$ cut in volcanic rock set in ground; cairn of rock 5 feet high erected over mark.

[Latitude, 43° 47′ 19.60″. Longitude, 110° 04′ 24.55″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Younts	217 47 59.23	37 56 39.56	4.4360462
Gravel	123 18 06.91	303 06 05.62	4.4437946

BURNT, UINTA COUNTY.

High point of timbered ridge on south side of Gros Ventre River, about 6 miles above mouth of Indian Creek. Peak is partly covered with burnt timber.

Station mark: $\overset{+}{\Delta}$ cut in quartz bowlder set level with surface of ground.

[Latitude, 43° 31′ 34.24″. Longitude, 110° 07′ 47.68″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sheep	93 47 42.33	273 31 28.44	4.5025522
Mount Leidy	135 07 20.70	314 55 58.61	4.4963469

GRAVEL, UINTA COUNTY.

A rather sharp peak about 10 miles northeast of mouth of Buffalo Fork of Snake River and 3 miles south of Pacific Creek. The peak is timbered near summit on the west and north. The formation is waterworn, cemented gravel.

Station mark: A cross (+) chiseled in a large bowlder set in the ground.

[Latitude, 43° 55′ 32.55″. Longitude, 110° 21′ 45.54″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Leidy	8 38 15.20	188 36 30.84	4.3514088
Signal Mountain	62 40 59.47	242 32 32.68	4.2642799
Mount Sheridan	160 49 35.13	340 42 41.34	4.6037314
Younts	260 49 21.71	81 10 05.28	4.6068613
Breccia	303 06 05.62	123 18 06.91	4.4437946

LAKE, YELLOWSTONE NATIONAL PARK.

About 300 yards east of Lake Astronomic Station, used only to connect the latter with the main triangulation scheme.

Station mark: None.

[Latitude, 44° 33′ 18.80″. Longitude, 110° 23′ 25.76.″]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Sheridan	18 54 00.56	198 48 14.58	4.5295745
Schurz	312 37 55.46	132 51 23.79	4.5409748
Table	316 49 44.27	137 03 53.01	4.5942268
Astronomic Station United States Coast and Geodetic Survey	94 57 59.60	274 57 51.45	2.41072

LAKE ASTRONOMIC STATION, YELLOWSTONE NATIONAL PARK.

Established by the United States Coast and Geodetic Survey.

About 20 feet south of the main wagon road, in an open, grassy park, about one-third mile east of the Lake Hotel, 700 feet north of Yellowstone Lake.

Station mark: A small copper bolt, leaded into a block of dressed granite 1½ by 2 by 3 feet.

	Latitude.	Longitude.
	° ′ ″	° ′ ″
As observed by United States Coast and Geodetic Survey	44 33 16.10	110 23 44.31
Adjusted value	44 33 19.51	110 23 37.37

MOUNT LEIDY, UINTA COUNTY.

On high, bare peak of that name 8 miles east of Cunningham's ranch, between Cement and Spread creeks. Formation is cemented waterworn gravel.

Station mark: Copper bolt in sandstone bowlder, set level with surface of ground. Cairn of bowlders 3 feet high with small pine tree in center over bolt.

[Latitude, 43° 43′ 33.06″. Longitude, 110° 24′ 16.25″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sheep	25 21 16.98	205 16 23.51	4.3481951
Spread Creek	119 29 20.67	299 23 03.69	4.1461532
Signal Mountain	136 43 18.51	316 36 36.93	4.2766282
Gravel	188 36 30.84	8 38 15.21	4.3514088
Younts	236 28 30.00	56 50 55.72	4.7153635
Burnt	314 55 58.61	135 07 20.70	4.4963469

SHEEP, UINTA COUNTY.

High, flat-topped peak known as Sheep Mountain, between Gros Ventre and Little Gros Ventre rivers, and 12 miles due east of mouth of former.

Station mark: Copper bolt in limestone rock set level with surface of the ground. Rock cairn 5 feet high erected over bolt.

[Latitude, 43° 32′ 40.04″. Longitude, 110° 31′ 21.51″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Signal Mountain	174 10 04.85	354 08 17.73	4.5325416
Mount Leidy	205 16 23.51	25 21 16.98	4.3481951
Burnt	273 31 28.44	93 47 42.33	4.5025522

MOUNT SHERIDAN, YELLOWSTONE NATIONAL PARK.

Highest peak in Red Mountain Range, 1 mile west of Heart Lake, 9 miles southeast of Lewis Lake.

Station mark: Copper bolt sunk into a large rock, which is centered under a large rock monument.

[Latitude, 46° 16′ 00.93″. Longitude, 110° 31′ 40.14″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Younts	300 32 08. 91	120 59 50. 28	4. 7905724
Table	264 48 28. 59	85 08 20. 33	4. 5797046
Gravel	340 42 41. 35	160 49 35. 13	4. 6037314
Schurz	256 49 20. 13	77 08 31. 68	4. 5740975
Ishawooa	274 25 00. 02	94 54 58. 01	4. 7586216

SPREAD CREEK (AZIMUTH STATION), UINTA COUNTY.

On flat 150 feet north of wagon road between two most southern delta branches of Spread Creek and one-half mile north of Cunningham's ranch.

Station mark: Cross (+) cut in rock, level with surface of ground.

[Latitude, 43° 47′ 16. 01″. Longitude, 110° 33′ 21. 31″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Signal Mountain	173 27 51. 43	353 27 27. 02	3. 8398943
Mount Leidy	299 23 03. 69	119 29 20. 67	4. 1461532

SIGNAL MOUNTAIN, UINTA COUNTY.

Prominent hill at foot of Jackson Lake, 1½ miles southwest of Menor's ferry across Snake River.

Station mark: Copper bolt in volcanic rock set level with surface of ground; tripod 12 feet high erected over bolt.

[Latitude, 43° 50′ 58.65″. Longitude, 110° 33′ 56.56″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Gravel	242 32 32. 68	62 40 59. 47	4. 2642799
Mount Leidy	316 36 36. 92	136 43 18. 51	4. 2766282
Spread Creek	353 27 27. 02	173 27 51. 43	3. 8398943
Sheep	354 08 17. 73	174 10 04. 85	4. 5325416

ANTELOPE, UINTA COUNTY.

On highest part of hill between Antelope Creek and Ditch Creek, about 1 mile east and a little north of Antelope Springs on the main wagon road from Elk post-office (Cunningham's ranch) to Jackson post-office, 8 miles east of Menor's ferry, 8 miles southeast of Elk post-office.

Station mark: Copper bolt leaded into a large rock buried flush with the ground.

Reference marks: Cross (+) chiseled on stone (white flint) set flush with the surface of the ground, 33.75 feet north of copper bolt.

[Latitude, 43° 42′ 42.56″. Longitude, 110° 35′ 00.11″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Signal Mountain	185 17 45.93	5 18 29.90	4.1868591
Sheep	345 12 54.17	165 15 25.00	4.2839823
North base	121 17 33.02	301 13 36.02	3.9530459

JACKSON, UINTA COUNTY.

A high and very prominent white rock peak near the head of Sheep Creek, about 6 miles southeast of Nolan's ranch, about 10 miles east of Jackson post-office. This peak was occupied by the Hayden survey, and is known to some of the settlers as Goodwin Peak.

Station mark: Copper bolt sunk into rock and buried under a 9-foot rock monument.

Reference mark: $\frac{\text{U} \mid \text{S}}{\text{G} \mid \text{S}}$ cut on rock 22.40 feet southeast of station.

[Latitude, 43° 27′ 46.94″. Longitude, 110° 37′ 30.51″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Victor	105 02 15.35	284 47 37.57	4.4720027
Buck	148 23 06.71	328 15 08.68	4.4716683
Phillips	117 28 09.09	297 16 39.30	4.4037480
Blacktail	164 31 14.52	344 28 30.74	4.3002202
Sheep	222 28 02.08	42 32 16.11	4.0888234

TETON NORTH BASE, UINTA COUNTY.

On west side of Snake River, about 8 miles north of Menor's ferry, 5 miles northeast of the wagon road crossing on Cottonwood Creek, 1½ miles northeast of the north end of the timbered island on the grass plat southeast of Jennys Lake. The wagon road crosses the base line about 1 mile south of the station and then bends and runs northeast between the line and Snake River.

Station mark: Bronze tablet leaded into a large bowlder buried flush with the ground.

Reference marks: On each side of the tablet, on, and in the prolongation of the line, is buried flush with the surface of the ground a stone with a cross (+) chiseled on it.

[Latitude, 43° 45′ 13.47″. Longitude, 110° 40′ 42.94″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Buck	57 45 24.76	237 39 38.45	4.1227536
Antelope	301 13 36.02	121 17 33.02	3.9530459
Blacktail	4 26 31.45	184 26 00.18	4.1173037
South base	27 28 56.67	207 27 08.61	3.8800267

Measured distance between North and South base, 3.8800392.

BLACKTAIL, UINTA COUNTY.

On the southwest end of the highest point of Blacktail Butte, about 1 mile south and east of Menor's ferry.

Station mark: Copper bolt sunk into the limestone rock.

Reference mark: Cross (+) chiseled on limestone rock, 4.80 feet northeast of station.

[Latitude, 43° 38′ 10.25″. Longitude, 110° 41′ 28.21″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
South base	158 33 10.01	338 31 53.33	3.8326432
Antelope	225 55 58.15	46 00 26.16	4.0824952
Buck	120 22 28.84	300 17 14.20	4.0730130
Sheep	306 46 04.99	126 53 03.32	4.2305043
North base	184 26 00.18	4 26 31.45	4.1173037
Jackson	344 28 30.74	164 31 14.52	4.3002202

TETON SOUTH BASE, UINTA COUNTY.

Is located about one-fourth mile northeast of the wagon road crossing Cottonwood Creek, about one-half mile northwest of two tall pine trees that grow on the north bank of Cottonwood Creek, 3 miles north of Menor's ferry, 1½ miles southeast of the south end of the long island of timber situated southeast of Jennys Lake.

Station mark: A bronze tablet leaded into a large bowlder buried flush with the ground.

Reference marks: On each side of the tablet, on, and in the prolongation of the base line, is buried flush with the ground a stone with a cross (+) chiseled on it.

[Latitude, 43° 41′ 35.37″. Longitude, 110° 43′ 19.27″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Blacktail	338 31 53.33	158 33 10.01	3.8326432
North base	207 27 08.61	27 28 56.67	3.8800267
North base, measured distance			3.8800392
Antelope	259 26 27.59	79 32 12.48	4.0556534
Buck	87 23 29.31	267 19 31.20	3.8880432

GRAND TETON, UINTA COUNTY (not occupied).

Highest peak in Wyoming. A well-known peak about 55 miles east of and plainly visible from Market Lake, Idaho.

Station mark: Flag erected by the Owens party, that first climbed the peak in 1897.

[Latitude, 43° 44′ 30.8″. Longitude, 110° 48′ 03.4″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Leidy	273 03 25	93 19 52	4.5049746
Sheep	314 14 06	134 25 38	4.4968019

BUCK, UINTA COUNTY.

On a high rocky knob about 3 miles southeast of the Teton Peaks, about 6 miles northwest of and visible from Menor's ferry.

Station mark: Cross (+) cut into a large rock buried in ground under a 6-foot rock monument.

Reference mark: $\frac{\text{U S}}{\text{G S}}$ cut on solid rock 15.62 feet south of station.

[Latitude, 43° 41′ 23.83″. Longitude, 110° 49′ 03.97″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sheep	304 03 28.42	124 15 41.37	4.4592345
Jackson	328 15 08.68	148 23 06.71	4.4716683
Phillips	27 02 08.33	206 58 35.59	4.1824511
Antelope	262 35 28.31	82 45 11.35	4.2799065
Victor	36 38 03.54	216 31 22.26	4.3402694
South base	267 19 31.20	87 23 29.31	3.8880432
North base	237 39 38.45	57 45 24.76	4.1227536
Blacktail	300 17 14.20	120 22 28.84	4.0730130

PHILLIPS, UINTA COUNTY.

On a high rocky knob on divide between the drainage of Snake and Teton rivers, at the head of Phillips and Moose creeks, 1 mile northwest of Phillips Pass, 3 miles northwest of Teton Pass.

Station mark: Cross (+) chiseled on a large rock buried under a rock monument.

Reference mark: $\begin{array}{c|c} \text{U} & \text{S} \\ \text{G} & \text{S} \end{array}$ chiseled into solid rock 12.58 feet northeast of station.

[Latitude, 43° 34′ 04.41″. Longitude, 110° 54′ 12.28″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Buck	206 58 35.59	27 02 08.33	4.1824511
Jackson	297 16 39.30	117 28 09.09	4.4037480
Victor	56 48 59.21	236 45 50.81	3.8654626

VICTOR, UINTA COUNTY.

Near the Idaho line, on a high, bald, red-topped mountain, on divide between Trail and Moose creeks, 10 miles southeast of Victor, Idaho, 1 mile northwest of road ranch on the Victor-Jackson road at the junction of Coal and Trail creeks, 3 miles northeast of the Teton Pass.

Station mark: Cross (+) chiseled into a large rock buried under a 6-foot rock monument.

Reference mark: U.S. chiseled on solid rock 6.41 feet north of station.

[Latitude, 43° 31′ 54.22″. Longitude, 110° 58′ 45.73″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Bucks	216 31 22.26	36 38 03.54	4.3402694
Phillips	236 45 50.81	56 48 59.21	3.8654626
Sheep	267 38 56.14	87 57 48.76	4.5675215
Jackson	284 47 37.57	105 02 15.35	4.4720027

COLORADO.

Triangulation Stations.

Field work of triangulation in the vicinity of Denver was conducted during portions of the seasons of 1897, 1898, and 1899 by Mr. H. L. Baldwin, jr., topographer. Positions are based upon the geodetic coordinates of Table Mound and Mount Morrison, furnished by the Coast and Geodetic Survey March 19, 1900.

In order to determine preliminary distances before the connection was made with the Coast and Geodetic Survey stations, a base line $5\frac{3}{4}$ miles in length was measured along the Burlington Railroad northeast of Denver. The difference between the measured and computed distances is 1.04 feet, or an error of $\frac{1}{30000}$ (nearly). The distances published herewith are based on those furnished by the Coast and Geodetic Survey.

ARTHUR, WELD COUNTY.

On one of the sand hills about 20 miles east of Platteville and 1 mile east of the ranch house of S. M. Wiswell.

Station mark: An iron bench-mark post set 3 feet in the ground.

Reference mark: An inverted bottle buried 18 inches below surface of ground. True azimuth from station, 42° 01′; distant, 8.33 feet.

[Latitude, 40° 14′ 24.53″. Longitude, 104° 27′ 33.90″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Riley Mound	61 18 04	242 06 59	4.43987
Harrison	115 25 19	295 10 44	4.54844
Dewey	164 54 46	344 51 09	4.48132

DEWEY, WELD COUNTY.

About 10 miles northeast of Greeley, on high, open prairie.

Station mark: An iron bench-mark post set 3 feet in the ground.

[Latitude, 40° 30′ 12.62″. Longitude, 104° 33′ 08.74″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Riley Mound	21 21 35	201 14 06	4.65480
Harrison	59 36 35	239 25 24	4.44499
Arthur	344 51 09	164 54 46	4.48132

TABLE MOUND, ELBERT COUNTY.

A station of the United States Coast and Geodetic Survey, about 2¼ miles west of Elbert, on the highest hill in the vicinity and on land owned by George E. Cadwell.

Station mark: A three-fourths inch drill hole in a rock 15 inches square and 15 inches under ground.

Reference mark: Buried 28 inches under ground is the center of the bottom of an inverted bottle. Above this and concentric therewith is placed a drain tile, 5 inches diameter and 1 foot long. On top of this and about flush therewith is a brass bench-mark tablet. True azimuth from station, 258° 50′; distance, 3.51 feet.

[Latitude, 39° 14′ 01.02″. Longitude, 104° 34′ 33.20″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Raspberry	86 50 40.78	266 38 21.49	4.4485068
Mount Morrison	131 19 19	310 54 47	4.8662621
Round Hill	161 56 06.56	341 52 58.88	4.3586814

INDIAN MOUND, ARAPAHOE COUNTY.

On mound of that name near the southeast corner of sec. 36, T. 4 S., R. 65 W., and on the central one of the group of mounds which extends eastward.

Station mark: An iron bench-mark post set 3 feet in the ground.

Reference mark: A bottle buried 9 inches below the surface of ground, true azimuth from station being 181° 40′; distance, 5.5 feet.

[Latitude, 39° 39′ 17.20″. Longitude, 104° 35′ 05.09″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Riley Hill	56 48 23.08	236 35 25.32	4.5424545
Mount Morrison	91 51 31.53	271 27 14.18	4.7360154
Capitol	105 23 04.89	285 07 46.59	4.5503002
Henderson	139 23 12.45	319 14 05.93	4.4937489

ROUND HILL, ELBERT COUNTY.

About 1 mile southeast of Hilltop station of the Colorado and Southern Railway, a hill locally known as above. It is on land belonging to Mr. Potter, in NW. ¼ sec. 22, T. 7 S., R. 65 W., about 500 feet northeast of the railroad track and about 50 feet northwest of and 1 foot lower than the summit.

Station mark: No surface mark; an underground mark consists of a brown bottle buried in an upright position, the neck being 18 inches below surface of ground. Above this is an inverted bottle with neck broken off, the bottom of which is 12 inches below surface of ground.

[Latitude, 39° 25′ 45.01″. Longitude, 104° 39′ 29.31″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Raspberry	41 58 27.93	221 49 14.24	4.4957041
Riley Hill	104 32 44.23	284 22 35.42	4.3735577
Schweiger	118 52 22.56	298 44 19.62	4.3159877
Table Mound	341 52 58.88	161 56 06.56	4.3586814
Mount Morrison	119 04 48.72	298 43 22.78	4.7410064

RILEY MOUND, WELD COUNTY.

On mound of that name 3 miles northeast of Lupton.

Station mark: An upright bottle, the neck of which is 26 inches below surface of ground. Directly above and 12 inches below surface of ground is a bronze bench-mark tablet.

[Latitude, 40° 07′ 28.30″. Longitude, 104° 44′ 43.50″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Brighton	5 05 49.35	185 05 23.06	4.0374040
Morgan	55 20 34.92	235 09 48.80	4.4619340
Cleveland	76 41 07.41	256 34 56.08	4.1470673
Hogback	107 58 13.00	287 40 45.00	4.60631
Harrison	164 42 22.96	344 38 53.61	4.4620654
Dewey	201 14 06.00	21 21 35.00	4.65480
Arthur	242 06 59.00	62 18 04.00	4.43987

BRIGHTON, WELD COUNTY.

On the highest hill in NE. ¼ sec. 27, T. 1 N., R. 66 W., and about 4 miles northeast of the town of Brighton.

Station mark: An iron bench-mark post, set 3 feet in the ground.

Reference mark: An inverted bottle, the top of which is 9 inches below surface of the ground. True azimuth from station is 355° 35′; distance, 10.3 feet.

[Latitude, 40° 01′ 36.31″. Longitude, 104° 45′ 24.34″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Henderson	17 32 49.80	197 30 18.93	4.2677504
McKinley	54 51 34.89	234 46 55.27	4.1013222
Morgan	76 11 15.35	256 00 56.11	4.3718205
Cleveland	121 00 13.71	300 54 29.03	4.1702702
Riley Mound	185 05 23.06	5 05 49.35	4.0374040
Harrison	170 13 59.55	350 10 56.75	4.5952515

HENDERSON, ARAPAHOE COUNTY.

About 5 miles southeast from Henderson station, Union Pacific Railroad, on the highest part of the rolling prairie.

Station mark: An iron bench-mark post, set 3 feet in the gound.

[Latitude, 39° 52′ 03.56″. Longitude, 104° 49′ 19.33″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Capitol	44 14 20.30	224 08 06.45	4.2995354
South base	62 00 26.93	241 57 04.88	3.9289889
Westminster Summit	94 19 07.65	274 11 08.70	4.2504956
Morgan	124 50 18.50	304 42 31.08	4.3234204
McKinley	155 26 21.02	335 24 12.64	4.0578445
North base	160 27 10.99	340 26 44.06	3.4745589
Brighton	197 30 18.93	17 32 49.80	4.2677504
Indian Mound	319 14 05.93	139 23 12.45	4.4937489

DENVER NORTH BASE, ARAPAHOE COUNTY.

About 1,060 feet southeast from the center line of the Burlington railroad track, and about 6¼ miles northeast of Derby station, on the highest ground in the vicinity.

Station mark: An iron bench-mark post, set 3 feet in the ground.

Reference marks: First, on the base line, southwestward and 28 inches below surface of ground is placed a lettered bronze bench-mark tablet. Above this is an inverted bottle having on its bottom a small bead (not central) and which is directly above the + on tablet, each being distant from the station mark 25.02 feet. Second, on the prolongation of the base line northeastward, a similar mark except that instead of a bead on the bottom of the bottle a + is cut in the glass; distance 25.02 feet from the station mark.

[Latitude, 39° 53′ 34.68″. Longitude, 104° 50′ 01.33″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
South base	43 43 05.99	223 40 10.81	3.9733256
McKinley	153 39 56.46	333 38 15.01	3.9272554
Henderson	340 26 44.06	160 27 10.99	3.4745589

HARRISON, WELD COUNTY.

On the high prairie, 10 miles southwest of Greeley.

Station mark: An iron bench-mark post, set 3 feet in the ground.

[Latitude, 40° 22′ 34.41″. Longitude, 104° 50′ 07.50″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cleveland	10 51 02.81	190 48 19.79	4.5018339
Hogback	63 13 12.00	242 59 10.00	4.53723
Dewey	239 25 34.00	59 36 35.00	4.44499
Arthur	295 10 44.00	115 25 19.00	4.54844
Riley Mound	344 38 53.61	164 42 22.96	4.4620654
Brighton	350 10 56.75	170 13 59.55	4.5952515

SCHWEIGER, DOUGLAS COUNTY.

On the north end of the first high bluff of the Jack Hills, west of the Happy Canyon road, on land owned by John Schweiger.

Station mark: An iron bench-mark post, set 3 feet in rocky ground.

Reference mark: An inverted bottle buried 9 inches below surface of ground. True azimuth from station, 196° 47′; distance, 10.26 feet.

[Latitude, 39° 31′ 08.45″. Longitude, 104° 52′ 08.21″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Raspberry	4 41 57.62	184 40 45.28	4.5236530
Riley Hill	49 20 43.94	229 18 37.77	3.7957792
Mount Morrison	119 04 15.77	298 50 52.23	4.5363182
Chamberlain Observatory	157 38 35.71	337 35 24.28	4.2745825
Round Hill	298 44 19.62	118 52 22.56	4.3159877

M'KINLEY, ARAPAHOE COUNTY.

On the flat prairie three-fourths of a mile west of the low bluffs west of the Platte River and 3 miles southwest from Brighton, on land owned by A. Cross.

Station mark: An iron bench-mark post, set 3 feet in the ground.

Reference mark: A bottle buried 9 inches below the surface of the ground. True azimuth from station, 161° 58′; distance, 9.87 feet.

[Latitude, 39° 57′ 40.42″. Longitude, 104° 52′ 39.41″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
South base	10 47 27.18	190 46 13.25	4.1654554
Morgan	97 24 46.28	277 19 06.93	4.1018058
Cleveland	170 55 06.62	350 54 02.00	4.1783309
Brighton	234 46 55.27	54 51 34.89	4.1013222
North base	333 38 15.01	153 39 56.46	3.9272554
Henderson	335 24 12.64	155 26 21.02	4.0578445

RASPBERRY, DOUGLAS COUNTY.

On highest point of easternmost part of hill of that name, and 1½ miles southwest of Larkspur.

Station mark: A bronze tablet set in loose gravel 5 inches below surface of ground. Resting central on this is a glass telegraph insulator covered with an inch of dirt. Above all is placed a flat limestone rock 18 inches square and 5 inches thick, marked △ and banked about with smaller rock.

[Latitude, 39° 13′ 09.26″. Longitude, 104° 54′ 02.25.″]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Morrison	151 19 33.94	331 07 25.42	4.7555835
Riley Hill	176 03 13.45	356 02 20.01	4.4665468
Schweiger	184 40 45.28	4 41 57.62	4.5236530
Round Hill	221 49 14.24	41 58 27.93	4.4957041
Table Mound	266 38 21.49	86 50 40.78	4.4485068

CLEVELAND, WELD COUNTY.

On the highest part of the divide between the Platte River and Boulder Creek, about 5 miles west and 1 mile north of Lupton.

Station mark: An iron bench-mark post set 3 feet in the ground.

Reference mark: The neck of a large bottle buried 12 inches below surface of ground. True azimuth from station 292° 16′, distance 6.12 feet.

[Latitude, 40° 05′ 43.14″. Longitude, 104° 54′ 19.87″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Morgan	37 26 12.51	217 21 37.30	4.2227329
Hogback	122 15 18.00	302 04 02.00	4.46712
Harrison	190 48 19.79	10 51 02.81	4.5018339
Riley Mound	256 34 56.08	76 41 07.41	4.1470673
Brighton	300 54 29.03	121 00 13.71	4.1702702
McKinley	350 54 02.00	170 55 06.62	4.1783309

DENVER SOUTH BASE, ARAPAHOE COUNTY.

Located on top of the spoil bank by the first railroad cut northeast of Derby station on the Burlington Railroad.

Station mark: An iron bench-mark post set 42 inches in the ground.

Reference marks: First, 25.04 feet northeastward on the base line and 28 inches below the surface of the ground is placed a lettered bronze bench mark tablet. Above this is an inverted bottle with small bead on the center of its bottom, directly above cross on tablet. Second, 25 feet southwestward, on prolongation of base line, a similar mark, except that bead on bottom of bottle is replaced by a small + cut in the glass. Third, cupola of Derby station. True azimuth from station is 42° 35′; distance, 1,503 feet.

[Latitude, 39° 49′ 54.21″. Longitude, 104° 54′ 34.65″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Capitol	31 50 31.83	211 47 39.92	4.0836793
Westminster Summit	117 23 30.22	297 18 53.53	4.0627758
McKinley	190 46 13.25	10 47 27.18	4.1654554
North base	223 40 10.81	43 43 05.99	3.9733256
Henderson	241 57 04.88	62 00 26.93	3.9289889

RILEY HILL, DOUGLAS COUNTY.

About three-fourths of a mile north of the junction of the Happy Canyon road with the old Colorado road, and about 125 feet east of where the latter crosses Riley Hill. It is on a large conglomerate rock 5 by 9 feet in size, 3 feet above ground, and next to the easternmost one of the group of similar rocks.

Station mark: An aluminum bench-mark tablet cemented in a large hole in the rock.

[Latitude, 39° 28′ 56.40″. Longitude, 104° 55′ 26.56″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Morrison	129 20 51.59	309 09 34.78	4.5151399
Capitol	169 43 57.19	349 41 39.00	4.4617129
Schweiger	229 18 37.77	49 20 43.94	3.7957792
Indian Mound	236 35 25.32	56 48 23.08	4.5424545
Round Hill	284 22 35.42	104 32 44.23	4.3735577
Raspberry	356 02 20.01	176 03 13.45	4.4665468

CHAMBERLAIN OBSERVATORY, ARAPAHOE COUNTY.

Center of dome of the Chamberlain Observatory, at University Park, Denver.

[Latitude, 39° 40′ 32.66″. Longitude, 104° 57′ 08.55″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Morrison	88 11 58.59	268 01 45.49	4.3598782
Capitol	158 43 18.63	338 42 05.76	3.8767843
Schweiger	337 35 24.28	157 38 35.71	4.2745825

CAPITOL, ARAPAHOE COUNTY.

Center of dome of the Colorado State capitol at Denver.

Reference mark: The point occupied by the theodolite, which was 1¼ feet west of a point due north of the center of the dome and near the center edge of the balcony walk; $\genfrac{}{}{0pt}{}{\text{U.}}{\text{G.}}\triangle\genfrac{}{}{0pt}{}{\text{S.}}{\text{S.}}$ marked on the iron floor. True azimuth from station, 177° 53′. Distance, 30.30 feet.

[Latitude, 39° 44′ 20.15″. Longitude, 104° 59′ 03.30.″]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Morrison	68 59 05.80	248 50 05.59	4.3342904
Table Mountain..........	107 30 30.69	287 22 13.49	4.2876486
Westminster Summit....	166 03 32.07	346 01 47.65	4.2064754
South base...............	211 47 39.92	31 50 31.83	4.0836793
Henderson	224 08 06.45	44 14 20.30	4.2995354
Indian Mound	285 07 46.59	105 23 04.89	4.5503002
Chamberlain Observatory	338 42 05.76	158 43 18.63	3.8767843
Riley Hill	349 41 39	169 43 57.19	4.4617129

MORGAN, ARAPAHOE COUNTY.

About 5 miles east of Louisville, on the easternmost of two small mounds.

Station mark: An iron bench-mark post set 3 feet in the ground.

Reference mark: A bottle buried 8 inches below surface of ground. True azimuth from station, 104° 14′; distance, 9.87 feet.

[Latitude, 39° 58′ 32.97″. Longitude, 105° 01′ 27.70.″]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Westminster Summit....	2 22 51.89	182 22 39.88	4.0293581
Table Mountain..........	36 20 00.69	216 13 14.86	4.4051215
South Boulder Peak.....	85 43 46	265 33 21	4.36462
Hogback	153 03 47	332 57 11	4.51063
Cleveland	217 21 37.30	37 26 12.51	4.2227329
Riley Mound	235 09 48.80	55 20 34.92	4.4619340
Brighton	256 00 56.11	76 11 15.35	4.3718205
McKinley	277 19 06.93	97 24 46.28	4.1018058
Henderson	304 42 31.08	124 50 18.50	4.3234204

WESTMINSTER SUMMIT, ARAPAHOE COUNTY.

On the high level prairie, about 2 miles north of Westminster College and one-fourth mile west of public road, in NW. ¼ sec. 18, T. 2 S., R. 68 W.

Station mark: An iron bench-mark post set 3 feet in the ground.

Reference mark: A bottle buried with its top 10 inches below surface of ground. True azimuth from station is 352° 01′; distance, 5.28 feet.

[Latitude, 39° 52′ 46.36″. Longitude, 105° 01′ 46.40″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Morrison	34 50 55.17	214 43 38.52	4.4543904
Table Mountain..........	56 11 31.78	236 04 58.33	4.2452166
South Boulder Peak.....	111 36 00.00	291 25 48.00	4.38656
Morgan	182 22 39.88	2 22 51.89	4.0293581
Henderson	274 11 08.70	94 19 07.65	4.2504956
South base	297 18 53.53	117 23 30.22	4.0627758
Capitol..................	346 01 47.65	166 03 32.07	4.2064754

HOGBACK, BOULDER COUNTY.

On the highest part of the prominent ridge, or hogback, 2 miles north of Hygiene.

Station mark: A copper bolt cemented in the conglomerate rock.

Reference mark: An arrow with crossbar cut in the rock and pointing to the station. True azimuth from station 244° 42′; distance 2.22 feet.

[Latitude, 40° 14′ 09.08″. Longitude, 105° 11′ 48.68″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
South Boulder Peak	15 15 02	195 13 10	4.50173
Harrison	242 59 10	63 13 12	4.53723
Riley Mound	287 40 45	107 58 13	4.60631
Cleveland	302 04 02	122 15 18	4.46712
Morgan	332 57 11	153 03 47	4.51063

TABLE MOUNTAIN, JEFFERSON COUNTY.

On the northeast part of Table Mountain, 3 miles northeast of Golden.

Station mark: A copper bolt set in the flat basalt rock and marked U. $\overset{\text{S. G.}}{\triangle}$ S.

[Latitude, 39° 47′ 28.61″. Longitude, 105° 12′ 00.61″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Morrison	6 50 11.58	186 49 27.91	4.1360452
South Boulder Peak	156 42 37.00	336 39 00.00	4.30958
Morgan	216 13 14.86	36 20 00.69	4.4051225
Westminster Summit	236 04 58.33	56 11 31.78	4.2452166
Capitol	287 22 13.49	107 30 30.69	4.2876486

MOUNT MORRISON, JEFFERSON COUNTY.

A secondary station of the United States Coast and Geodetic Survey, on the mountain of the same name, about 3 miles northwest of the town of Morrison.

Station mark: A drill hole, three-fourths inch diameter and 4 inches deep, in the rock at summit.

Reference mark: The point occupied by theodolite, which is marked by a copper bolt, stamped U. S. G. S., with arrow pointing to station mark. True azimuth from station, 311° 41′; distance, 10.27 feet.

[Latitude, 39° 40′ 08.23″. Longitude, 105° 13′ 08.93″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
South Boulder Peak	178 43 24.00	348 40 30.00	4.51788
Table Mountain	186 49 27.91	6 50 11.58	4.1360452
Westminster Summit ...	214 43 38.52	34 50 55.17	4.4543904
Capitol	248 50 05.59	68 59 05.80	4.3342904
Chamberlain Observatory	268 01 45.49	88 11 58.59	4.3598782
Indian Mound	271 27 14.18	91 51 31.53	4.7360154
Schweiger	298 50 52.23	119 04 15.77	4.5363182
Round Hill	298 43 22.78	119 04 48.72	4.7410064
Riley Hill	309 09 34.78	129 20 51.59	4.5151399
Table Mound	310 54 47.00	131 19 19.00	4.8662621
Raspberry	331 07 25.42	151 19 33.94	4.7555835

SOUTH BOULDER PEAK, BOULDER COUNTY (not occupied).

On the northeastern summit, and probably the lower of the two peaks, generally known as South Boulder Peak. The signal is a pine tree fastened in an upright position about 6 feet west of a prominent red rock at summit of mountain. A hole was drilled in the rock and three grooves were cut for foot screws of theodolite.

[Latitude, 39° 57′ 35.95″. Longitude, 105° 17′ 40.38″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Hogback	195 13 10	15 15 02	4.50173
Morgan	265 33 21	85 43 46	4.36457
Westminster Summit....	291 25 48	111 36 00	4.38656
Table Mountain.........	336 39 00	156 42 37	4.30958
Mount Morrison	348 40 30	178 43 24	4.51788

Secondary Positions.

The following positions were computed from two or more unclosed triangles, from primary stations:

Geographic positions in Colorado.

Station.	Latitude.	Longitude.
DENVER, ARAPAHOE COUNTY.	° ′ ″	° ′ ″
Jarvis Hall, tower	39 43 56.1	104 54 01.8
Church at Montclair, spire of	39 44 12.4	104 54 13.7
Capitol Hill, standpipe	39 43 07.3	104 56 02.5
Denver University, tower	39 40 36.9	104 57 41.1
Grant smelter, chimney	39 46 34.5	104 58 22.2
Christ Methodist Episcopal Church, spire	39 44 57.6	104 58 26.9
Central Presbyterian Church, spire	39 44 33.6	104 59 02.4
Trinity Methodist Episcopal Church, spire	39 44 41.0	104 59 11.7
Court-house, cupola	39 44 31.5	104 59 20.9
County Hospital, chimney	39 43 34.3	104 59 25.5
High School building, old, cupola of	39 44 57.12	104 59 36.76
City Hall, spire	39 44 49.3	104 59 58.4
Union station, tower	39 45 10.4	104 59 58.5
Academy, Sisters of Loretta, cupola	39 39 40.4	105 01 37.5
Westminster University, tower on	39 50 48.7	105 01 52.8
Jesuit College, tower on	39 47 24.7	105 01 58.3
St. Anthony Hospital, tower	39 44 33.6	105 02 25.7
North Denver, powerhouse chimney	39 46 09.6	105 02 39.0
North Denver, standpipe	39 45 51.3	105 03 08.3
HILLTOP, DOUGLAS COUNTY.		
Tall tree near "Mile Square Farm"	39 27 11.6	104 40 44.1
LASALLE, WELD COUNTY.		
Schoolhouse, tower	40 21 01.2	104 42 16.6
BARR, ARAPAHOE COUNTY.		
Schoolhouse, spire	39 56 34.2	104 46 35.5
LUPTON, WELD COUNTY.		
Old schoolhouse, spire	40 05 11.9	104 48 31.2
New schoolhouse, spire	40 05 11.9	104 48 31.6
BRIGHTON, ARAPAHOE COUNTY.		
Catholic church, spire	39 59 05.2	104 49 07.3
Opera house, cupola	39 59 10.6	104 49 17.3
Astronomic pier	39 59 20.40	104 49 10.20

Geographic positions in Colorado—Continued.

Station.	Latitude.	Longitude.
PLATTEVILLE, WELD COUNTY.	° ' "	° ' "
Methodist Episcopal church, spire	40 12 57.5	104 49 20.3
MAGNOLIA, ARAPAHOE COUNTY.		
Railroad water tank	39 42 46.1	104 50 52.3
STORMY PEAK, DOUGLAS COUNTY.		
Highest point	39 11 41.7	105 00 01.9
FORT LOGAN, ARAPAHOE COUNTY.		
Flagstaff	39 38 32.1	105 02 06.0
Standpipe	39 38 24.0	105 02 30.4
LONGMONT, BOULDER COUNTY.		
High school, spire	40 10 07.2	105 05 42.9
PLATTE PEAK, OR DEVILS HEAD, DOUGLAS COUNTY.		
Highest point	39 15 36.0	105 06 02.3
VALMONT BUTTE, BOULDER COUNTY.		
Highest point	40 01 49.5	105 12 39.6
HAYSTACK MOUNTAIN, BOULDER COUNTY.		
Highest point	40 06 39.2	105 13 25.9
BOULDER, BOULDER COUNTY.		
State University, tower on	40 01 02.4	105 16 14.1
GOLDEN PEAK, JEFFERSON COUNTY.		
Highest point	39 48 58.1	105 21 02.6

The following positions were determined by the measurement of distances and directions from primary triangulation stations:

Geographic positions on section lines in Colorado.

Station.	Latitude.	Longitude.
	° ' "	° ' "
Sec. 9, T. 3 N., R. 63 W., southeast corner of	40 13 58.20	104 27 11.67
Quarter-section corner between secs. 29 and 32, T. 9 S., R. 64 W	39 13 49.72	104 34 46.44
Quarter-section corner on south side of sec. 31, T. 4 S., R. 64 W	39 39 08.35	104 35 37.72

Geographic positions on section lines in Colorado—Continued.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Sec. 22, T. 7 S., R. 65 W., northwest corner of.	39 26 02.64	104 39 43.60
Sec. 19, T. 2 S., R. 66 W., northwest corner of.	39 52 13.56	104 49 38.24
Quarter-section corner between secs. 27 and 28, T. 1 N., R. 66 W	40 01 19.02	104 46 19.56
Sec. 36, T. 5 N., R. 67 W., southeast corner of.	40 22 39.05	104 49 53.57
Sec. 15, T. 5 S., R. 67 W., northeast corner of.	39 31 16.86	104 51 59.84
Quarter-section corner on south side of sec. 33, T. 2 N., R. 67 W	40 05 13.66	104 53 09.03
Sec. 32, T. 2 S., R. 67 W., southeast corner of.	39 49 36.99	104 54 09.59
Sec. 32, T. 5 S., R. 67 W., southwest corner of.	39 28 40.62	104 55 23.28
Quarter-section corner between secs. 8 and 17, T. 2 S., R. 68 W	39 53 05.07	105 01 27.79
Quarter-section corner between secs. 8 and 17, T. 1 S., R. 68 W	39 58 18.94	105 01 28.11
Sec. 2, T. 3 N., R. 70 W., southeast corner of..	40 13 45.34	105 10 37.61

The following quarter section corners were determined by measurements from points located by three or more intersections from primary stations.

Geographic positions of quarter-section corners in Colorado.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Quarter corner between secs. 30 and 31, T. 2 N., R. 66 W	40 05 13.23	104 48 35.40
Quarter corner between secs. 6 and 7, T. 1 S., R. 66 W	39 59 11.42	104 49 03.45
Quarter corner between secs. 18 and 19, T. 3 N., R. 66 W	40 13 01.28	104 49 10.22
Quarter corner between secs. 2 and 3, T. 2 N., R. 69 W	40 10 02.10	105 05 32.74

Meridian Marks.

GREELEY, WELD COUNTY.

Location of station: In southwest corner of court-house grounds, about 15 feet north of the jail and about same distance west of the southwest corner of the court-house, at edge of lawn just north of graveled roadway.

Station mark: Sandstone post, 36 by 8 by 8 inches, set 30 inches in the ground, in the center of top of which is cemented a bronze tablet.

Distant mark: North of station 441.2 feet. In north side of the south half of the city park, about 100 feet north and a few feet east of the artesian well. Sandstone post, 36 by 8 by 8 inches, set 30 inches in the ground, in the center of top of which is cemented a bronze tablet.

Resident referee: County surveyor.

GOLDEN, JEFFERSON COUNTY.

Location of station: On the summit of a small ridge about one-fourth mile south of the public school building in the town of Golden, 600 feet south of bridge over the irrigation canal.

Station mark: A red sandstone post, 42 by 12 by 6 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Reference marks: Meridian stone, N. 0° 00′ 07″ E.; flag pole of public school, N. 0° 01′ 06″ W.; east corner of public school, N. 0° 59′ 33″ W.; south corner of public school, N. 3° 10′ 43″ W.; west corner of public school, N. 4° 36′ 23″ W.; chimney fire-brick works, N. 20° 55′ 09″ W.

Distant mark: North of station 577.8 feet. A red sandstone post, 42 by 12 by 6 inches, set 36 inches in the ground, in the center of top of which is cemented a bronze tablet. Post about 25 feet south of bridge over irrigation canal.

Resident referees: Professor and students of civil engineering of the School of Mines.

TEXAS.

Triangulation Stations.

The Texas triangulation of 1884 and for some years thereafter was executed with vernier theodolites, and depended on an astronomic position established at Austin by the United States Coast and Geodetic Survey in 1872, Allegheny, Pennsylvania, being the base station for longitude.

An astronomic station was established and a base line measured in 1896 at Spofford, Texas, by Mr. S. S. Gannett (see Appendix to Eighteenth Annual Report, page 201), from which triangulation was extended eastward via San Antonio to Yegua Knob, a station located from the Austin position. The position of the reference mark at this station is as follows:

	Latitude.	Longitude.
	° ′ ″	° ′ ″
Position determined in 1884 from Austin	30 20 32.16	97 11 20.30
1897 correction to longitude. (See note under Yegua Knob)		+3.51
Corrected Austin position	30 20 32.16	97 11 23.81
1899 position (from Spofford)	30 20 34.51	97 11 26.69
Difference	2.35	2.88

An attempt was made to reoccupy the 1884 Texas Hill station, but the station marks had been destroyed and the location was therefore so uncertain that the connection was disregarded. It may be stated, however, that the difference between the 1884 and 1899 values for the line Yegua-Texas Hill amounted to 8 feet.

The position of the San Antonio 1882 transit of Venus astronomic station, reduced to the clock tower and without the correction to longitude needed to reduce it to 1897 standard, is:

	Latitude.	Longitude.
	° ′ ″	° ′ ″
San Antonio transit of Venus position, 1882	29 26 40.87	98 27 37.34
United States Geological Survey, 1899	29 26 39.86	98 27 42.76
Difference	1.01	5.42

On account of the uncertainty in identifying the exact point, no adjustment was attempted for this connection. It is thought, however, that the exact locality of the station was determined.

The longitude for each of the following is based on the 1897 position of Washington University, St. Louis, viz, 6^h 00^m 49.261^s, and all positions and distances are those computed from the Spofford base and astronomic station.

OBAR, FAYETTE COUNTY.

About 1½ miles southwest of Flatonia, on the eastern part of what is known as Obar Hill, in a pasture belonging to Mr. Stewart. Theodolite elevated 18 feet.

Station mark: An iron bench-mark post.

[Latitude, 29° 40′ 13.38″. Longitude, 97° 07′ 10.36″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Bailey	31 33 29.93	211 30 07.57	4.3240729
Pilot Grove	102 17 02.71	282 10 59.92	4.3042746
Scoby	132 23 55.24	312 17 45.57	4.4326711
Cistern	149 24 47.20	329 21 50.70	4.2735544
Iron	89 21 45.98	269 09 01.47	4.6184459

YEGUA KNOB, BASTROP COUNTY.

A station located in 1884, on most northern of the Yegua Knobs, one-fourth mile south of Nob Spring and about 5 miles northeast of the town of McDade.

Station mark: A copper bolt stamped $\overset{S\ \ G}{U\ \triangle\ S}$ set in solid rock, and in exact position of the reference mark of 1884.

[1899 value, latitude, 30° 20′ 34.51″. Longitude 97° 11′ 26.69″.]
[1884 value, latitude, 30 20 32.16 . Longitude 97 11 20.30.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Lotman	16 33 53.84	196 31 52.87	4.3530296
Caldwell	51 14 32.90	231 06 09.43	4.5344890
Texas Hill	56 36 25.96	236 25 56.86	4.6024798

NOTE.—The longitudes adopted in 1884 for Yegua Knob and Texas Hill should be increased by adding 3.51″ to each. This correction results from the 1897 adjustment of longitude in the United States by the Coast and Geodetic Survey.

CISTERN, FAYETTE COUNTY.

On the highest ground in the village of Cistern, on land belonging to Bush Cockrill, and in same lot as Wm. Menike's drug store. A platform 32 feet high was built in order to overlook the surrounding buildings.

Station mark: An iron bench-mark post.

[Latitude, 29° 48′ 58.15″. Longitude, 97° 13′ 06.13″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Pilot Grove	40 26 02.86	220 22 55.86	4.1934542
Scoby	101 18 44.76	281 15 31.21	4.0275371
Williams	148 39 38.47	328 37 47.52	4.0605101
Royston	177 04 53.23	357 04 35.55	4.2721426
Obar	329 21 50.70	149 24 47.20	4.2735543

ROYSTON, BASTROP COUNTY.

About 3 miles west of Smithville and 1½ miles south of the Colorado River, on the western end of the westernmost of several hills, all of about the same elevation. Hill covered with large pine trees. A fair outlook to southwest, west, and north can be had from the ground. Theodolite elevated 18 feet.

Station mark: An iron bench-mark post.

[Latitude, 29° 59′ 05.10″. Longitude, 97° 13′ 41.68″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Williams	29 31 45.51	209 30 12.02	4.0084120
Hog Springs	69 41 19.97	245 35 42.91	4.2983239
Caldwell	128 20 48.66	308 13 36.49	4.4688651
Lotman	171 09 28.96	351 08 36.27	4.2627204
Cistern	357 04 35.55	177 04 53.23	4.2721426

BAILEY, GONZALES COUNTY.

On the highest point of a line of bluffs overlooking Peach Creek Valley, near the Lavaca County line, on the Dilworth-Moulton road, about 4 miles from Dilworth and 7 miles from Moulton.

Station mark: Iron bench-mark post No. 267 of the level line.

[Latitude, 29° 30′ 29.53″. Longitude, 97° 14′ 00.18″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Tinsley	68 15 03.66	248 08 27.07	4.3691203
Nixon	98 31 37.54	278 17 54.37	4.6575070
Iron Peak	119 48 13.16	299 38 52.90	4.5461268
Pilot Grove	158 42 14.74	338 39 35.33	4.3780332
Obar	211 30 07.57	31 33 29.93	4.3240729

LOTMAN, BASTROP COUNTY.

On highest part of a pine-covered hill, about 6 miles northeast of Bastrop. The hill is the highest point for miles around and is locally known as Lotman Hill. Station is on the highest point of the hill. Theodolite elevated 32 feet above ground.

Station mark: An iron bench-mark post.

[Latitude, 30° 08′ 52.71″. Longitude, 97° 15′ 26.85″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Hog Springs	30 11 39.27	210 06 54.00	4.4829530
Texas Hill	89 03 28.56	268 55 01.91	4.4314443
Caldwell	90 27 41.52	270 21 21.10	4.3068768
Yegua Knob	196 31 52.87	16 33 53.84	4.3530296
Royston	351 08 36.27	171 09 28.96	4.2627204

WILLIAMS, BASTROP COUNTY.

In the Williams pasture, about 700 feet north of the Cistern-Rosanky road, 7 miles from Cistern and 2½ miles from Rosanky, on the south end of a ridge covered with post-oak.

Station mark: An iron bench-mark post.

[Latitude, 29° 54′ 16.96″. Longitude, 97° 16′ 48.98″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Scoby	30 00 34.29	209 59 11.46	3.9507091
Hog Springs	92 59 07.38	272 55 04.11	4.1174802
Royston	209 30 12.02	29 31 45.51	4.0084120
Cistern	328 37 47.52	148 39 38.47	4.0605101

PILOT GROVE, GONZALES COUNTY.

Station is situated in the northern part of the county, 2 miles northwest of Waelder, on highest ground in vicinity, on land belonging to Mr. Frumpton, and near a grove of post oaks that has been known since the early settlement of the country as Pilot Grove.

Station mark: An iron bench-mark post.

[Latitude, 29° 42′ 32.05″. Longitude, 97° 19′ 22.83″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Iron Peak	77 38 06.80	257 31 24.61	4.3494143
Scoby	178 37 38.16	358 37 31.97	4.1454048
Cistern	220 22 55.86	40 26 02.86	4.1934542
Obar	282 11 01.94	102 17 04.73	4.3042746
Bailey	338 39 35.33	158 42 14.74	4.3780332

SCOBY, BASTROP COUNTY.

In the southwestern part of the county, about 2 miles northeast of Jeddo, on a high knob about one-half mile east of the Waelder and Bastrop road, and about 9 miles from Waelder. Theodolite elevated 18 feet.

Station mark: An iron bench-mark post.

[Latitude, 29° 50′ 05.87″. Longitude, 97° 19′ 35.29″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Hog Springs	134 16 04.84	314 13 24.67	4.0809025
Williams	209 59 11.46	30 00 34.29	3.9507091
Cistern	281 15 31.21	101 18 44.76	4.0275371
Obar	312 17 45.57	132 23 55.24	4.4326711
Pilot Grove	358 37 31.97	178 37 38.16	4.1454048

HOG SPRINGS, BASTROP COUNTY.

In southwestern part of county, about 6 miles southwest of Red Rock, and on the highest hill in the vicinity, which is covered with post-oak and black-jack trees. A platform, 16 feet high, necessary to get a good outlook.

Station mark: An iron bench-mark post.

[Latitude, 29° 54′ 38.87″. Longitude, 97° 24′ 56.88″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Texas Hill	155 32 23.29	335 28 43.68	4.4527954
Caldwell	169 15 30.64	349 13 56.86	4.4298824
Lotman	210 06 54.00	30 11 39.27	4.4829530
Royston	245 35 42.91	65 41 19.97	4.2983239
Williams	272 55 04.11	92 59 07.38	4.1174802
Scoby	314 13 24.67	134 16 04.84	4.0809025

TINSLEY, GONZALES COUNTY.

On land belonging to G. W. Tinsley, of Gonzales. About 5 miles south of the Gonzales court-house, 1,252 feet south of the Gonzales-Yorktown road, and on the highest point of a wooded ridge.

Station mark: An iron bench-mark post.

[Latitude, 29° 25′ 47.29″. Longitude, 97° 27′ 26.34″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Capote	102 30 49.40	282 20 59.05	4.5200918
Nixon	123 27 38.89	303 20 33.66	4.4450284
Bailey	248 08 27.07	68 15 03.66	4.3691203

CALDWELL, BASTROP COUNTY.

In the western part of the county, near the line between Bastrop and Travis counties, about 2 miles north of the Bastrop and Austin road, and 10 miles west of north from Bastrop. The Red Rock and Elgin road passes one-eighth mile west of the station. This is the highest point in the vicinity and is covered with post-oak trees. Theodolite raised 20 feet above ground.

Station mark: An iron bench-mark post.

[Latitude, 30° 08′ 57.41″. Longitude, 97° 28′ 04.28″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Texas Hill	84 44 15.64	264 42 10.35	3.8298355
Yegua Knob	231 06 09.43	51 14 32.90	4.5344890
Lotman	270 21 21.10	90 27 41.52	4.3068768
Royston	308 13 36.49	128 20 48.66	4.4688651
Hog Springs	349 13 56.86	169 15 30.64	4.4298824

TEXAS HILL, TRAVIS COUNTY.

One of the stations of 1884. On a high mesquite hill, about 3 miles southwest of Elysium post-office.

Station mark: An iron bench-mark post set in 1898 at a point as near as could be determined to where the mark of 1884 was originally placed.

[Latitude, 30° 08′ 37.22″. Longitude, 97° 32′ 15.74″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Yegua Knob	236 25 56.86	56 36 25.96	4.6024798
Caldwell	264 42 10.35	84 44 15.61	3.8298355
Lotman	268 55 01.91	89 03 28.56	4.4314443
Hog Springs	335 28 43.68	155 32 23.29	4.4527954

IRON PEAK, GONZALES COUNTY.

In the northwestern part of the county, near the Caldwell County line, and on the highest part of a sharp, rocky hill about one-fourth mile north of the Galveston, Harrisburg and San Antonio Railway, 3 miles west of Harwood and about 1 mile east of Ivy Switch. The hill is covered with trees, but an excellent view of the country for miles around can be had from the rocky edges of the summit.

Station mark: A copper bolt set in the solid rock and stamped

S G
U △ S

[Latitude, 29° 39′ 55.88″. Longitude, 97° 32′ 54.92″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Nixon	53 11 04.44	233 06 40.05	4.2549761
Lone Elm	89 00 56.54	268 51 06.07	4.5063979
Pilot Grove	257 31 24.61	77 38 06.80	4.3494143
Obar	269 09 01.47	89 21 45.98	4.6184459
Bailey	299 38 52.90	119 48 13.16	4.5461268

NIXON, GONZALES COUNTY.

Near the boundary line of Guadalupe County, about 5 miles north of Belmont and about 1 mile south of William Nixon's place, on the highest hill in the vicinity.

Station mark: Bronze tablet set in a stone and buried 6 inches below surface of ground.

[Latitude, 29° 34′ 05.49″. . Longitude, 97° 41′ 49.91″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Capote	47 52 12.63	227 49 26.64	4.0874853
Lone Elm	119 57 55.81	299 52 30.57	4.3102925
Iron Peak	233 06 40.05	53 11 04.44	4.2549761
Bailey	278 17 54.37	98 31 37.54	4.6575070
Tinsley	303 20 33.66	123 27 38.89	4.4450284

CAPOTE, GUADALUPE COUNTY.

Near eastern line of the county and on the northern end of the most northern of the range of ridge-like hills known as Capote Hills. The hill upon which station is located is locally known as Porter Knob and is 6 miles southwest of Belmont.

Station mark: A copper bolt set in solid rock and stamped $\overset{S\ \ G}{U\ \triangle\ S}$

[Latitude, 29° 29′ 38.86″. Longitude, 97° 47′ 26.67″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Herndon	100 17 58.16	280 08 25.98	4.5021168
Mission Hill	124 09 09.14	303 58 04.81	4.6402519
Lone Elm	154 50 29.35	334 47 50.71	4.3081777
Nixon	227 49 26.64	47 52 12.63	4.0874853
Tinsley	282 20 59.05	102 30 49.40	4.5200918

LONE ELM, GUADALUPE COUNTY.

On the southern end of the easternmost of what are called the Elm Creek Hills, on the south side of Elm Creek, about 3 miles northwest of Kingsbury. Hill is covered with black-jack and post oak trees.

Station mark: An iron bench-mark post 3 feet in the ground.

[Latitude, 29° 39′ 36.48″. Longitude, 97° 52′ 48.07″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Herndon	60 36 16.13	240 29 21.26	4.4141931
Mission Hill	102 29 46.53	282 21 19.70	4.4498352
Iron Peak	268 51 06.07	89 00 56.54	4.5063979
Nixon	299 52 30.57	119 57 55.81	4.3102925
Capote	334 47 50.70	154 50 29.35	4.3081777

HERNDON, GUADALUPE COUNTY.

On a high ridge known as Herndon or Hunters Hill, about 9½ miles southwest of Seguin, about one-fourth mile south of the Seguin and San Antonio road. Is the highest point in the vicinity. Hill is covered by oak and mesquite trees.

Station mark: An iron bench-mark post.

[Latitude, 29° 32′ 41.98″. Longitude, 98° 06′ 47.92″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Martinez	76 07 29.80	256 01 15.60	4.3236633
Pfeil	129 05 43.78	309 02 47.37	4.0930098
Mission Hill	165 19 10.38	345 17 39.66	4.2891462
Lone Elm	240 29 21.26	60 36 16.13	4.4141931
Capote	280 08 25.98	100 17 58.16	4.5021168

MISSION HILL, COMAL COUNTY.

On the highest part of a hill known as Mission Hill, about 80 feet north of the house owned by Mr. Coreth and about 3 miles west of New Braunfels.

Station mark: An iron bench-mark post.

Reference mark: An iron bolt driven into the ground 6 inches below the surface and a stone with a cross cut on it placed over the bolt and flush with the surface of the ground.

[Latitude, 29° 42′ 53.37″. Longitude, 98° 09′ 51.40″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Pfeil	23 00 21.41	202 58 55.38	4.0779806
Miller	45 00 04.12	224 54 42.11	4.4167586
Bulverde	89 30 47.69	269 23 07.09	4.3975610
Lone Elm	282 21 19.70	102 29 46.53	4.4498352
Capote	303 58 04.81	124 09 09.14	4.6402519
Herndon	345 17 39.66	165 19 10.38	4.2891462

PFEIL, GAUDALUPE COUNTY.

Near the Cass County line, on the highest of the bare hills known as the Geronimo Hills, on land belonging to Edward Pfeil.

Station mark: An iron bench-mark post.

[Latitude, 29° 36′ 55.58″. Longitude, 98° 12′ 45.28″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Martinez	40 04 13.49	220 00 55.16	4.2259126
Miller	61 36 21.83	241 32 09.14	4.1949594
Bulverde	117 59 44.82	297 53 30.96	4.3616474
Mission Hill	202 58 55.38	23 00 21.41	4.0779806
Herndon	309 02 47.37	129 05 43.78	4.0930098

MARTINEZ, BEXAR COUNTY,

On northern end of a high ridge forming the divide between Cibolo and Salado creeks, on land belonging to Mr. Hoffrechter, about one-fourth of a mile north of the Seguin and San Antonio road, and about 12 miles east of San Antonio.

Station mark: An iron bolt driven in ground 12 inches below the surface.

Reference mark: An iron bench-mark post 21.2 feet distant; true azimuth from station, 329° 46′ 32″.

[Latitude, 29° 29′ 57.26″. Longitude, 98° 19′ 27.32″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Clock tower	65 33 18.88	245 29 15.13	4.1663400
Miller	151 23 30.96	331 22 36.84	3.7906747
Pfeil	220 00 55.16	40 04 13.49	4.2259126
Herndon	256 01 15.60	76 07 29.80	4.3236633

MILLER, BEXAR COUNTY.

On the highest part and near the southern end of the hills known as Lookout Mountains, about one-fourth of a mile south of the San Antonio and Austin road.

Station mark: An iron bench-mark post.

Reference mark: Cross (+) cut on rock set in ground.

[Latitude, 29° 32′ 53.31″. Longitude, 98° 21′ 17.14″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Clock tower	42 07 07.99	222 03 58.13	4.1902007
Gambrills	70 20 08.63	250 13 53.29	4.3383944
Helotes	97 50 51.67	277 39 38.84	4.5686384
Bulverde	160 15 13.75	340 13 13.34	4.2872754
Mission Hill	224 54 42.11	45 00 04.12	4.4167586
Pfeil	241 32 09.14	61 36 21.83	4.1949594
Martinez	331 22 36.84	151 23 30.96	3.7906747

BULVERDE, BEXAR COUNTY.

On the southernmost of three high hills about 2 miles east of Bulverde post-office, on Cibolo Creek and three-fourths of a mile east of Mecker's ranch, one-fourth of a mile south of Charles Voges's ranch. The Romple road passes one-half of a mile east of signal. The San Antonio-Bulverde road passes about 2 miles west of signal.

Station mark: A bronze tablet cemented into a flat limestone rock.

Reference mark: $\frac{\mathrm{U} \mid \mathrm{S}}{\mathrm{G} \mid \mathrm{S}}$ chiseled on a flat limestone rock 52 feet 9 inches from station.

[Latitude, 29° 42′ 45.57″. Longitude, 98° 25′ 20.69″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Gambrills	28 37 50.03	208 33 34.02	4.4645425
Helotes	66 21 00.15	246 11 46.11	4.5171879
Smith	85 17 13.73	265 07 06.84	4.5190982
Mission Hill	269 23 07.09	89 30 47.69	4.3975610
Pfeil	297 53 30.96	117 59 44.82	4.3616474
Miller	340 13 13.34	160 15 13.75	4.2872754

SAN ANTONIO CLOCK TOWER, BEXAR COUNTY.

A square stone structure about 60 feet high in yard of quartermaster's department at Fort Sam Houston, San Antonio, 825 feet north and 397 feet west of the cement foundation supposed to be the astronomic pier of the transit of Venus expedition of 1882.

Station mark: The center of the spire on clock tower.

[Latitude, 29° 26′ 39.86″. Longitude, 98° 27′ 42.76″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Miller	222 03 58.13	42 07 07.99	4.1902007
Martinez	245 29 15.13	65 33 18.88	4.1663400

LEON, BEXAR COUNTY.

On the top of highest hill 4 miles east of Leon Springs post-office, three-fourths of a mile southeast of an old ranch with rock corrals now owned by Oppenheimer, known by some as the Fink ranch.

Station mark: A bronze tablet cemented into a limestone rock.

Reference mark: $\frac{\mathrm{U}\,|\,\mathrm{S}}{\mathrm{G}\,|\,\mathrm{S}}$ cut in the limestone.

[Latitude, 29° 39′ 57.79″. Longitude, 98° 33′ 39.40.″]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Smith	97 03 51.43	276 57 51.88	4.2938889
Boerne	117 59 42.07	297 53 49.48	4.3353468
Bulverde	248 53 40.31	68 57 47.32	4.1574211

GAMBRILLS, BEXAR COUNTY.

On a hill (sometimes called the Eightmile Hill) in a pasture belonging to Mr. Gambrill, about 8 miles northwest of San Antonio, on either the Babcock or Bandera roads, about 1 mile north of General Russ's ranch.

Station mark: An iron bench-mark post.

Reference mark: Cross chiseled in rock buried flush with the ground under a large mesquite tree near the fence between Gambrill's and Russ's ranches.

[Latitude, 29° 28′ 54.48″. Longitude, 98° 33′ 59.05″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Wurzbach	79 12 57.35	259 04 49.75	4.4346176
Gallagher	116 58 54.27	296 50 34.25	4.4859784
Helotes	127 22 10.03	307 17 13.50	4.3089472
Smith	140 15 01.49	320 09 12.67	4.4728825
Bulverde	208 33 34.02	28 37 50.03	4.4645425
Miller	250 13 53.29	70 20 08.63	4.3383944

HELOTES, BEXAR COUNTY.

On the southeasternmost of two high hills in Jack Hoffman's pasture, about 3 miles west of Helotes post-office, 2 miles south of Bandera road to the foot of the hills, on the northeast part of the hill, and on the highest ground.

Station mark: A bronze tablet cemented into rock.

[Latitude, 29° 35′ 35.62″. Longitude, 98° 44′ 00.54″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Würzbach	31 02 09.39	210 58 57.28	4.3093254
Gallagher	97 45 48.09	277 42 24.31	4.0493358
Smith	164 54 32.71	344 53 40.75	4.0353926
Gambrills	307 17 13.50	127 22 10.03	4.3089473
Bulverde	246 11 46.11	66 21 00.15	4.5171879
Miller	277 39 38.84	97 50 51.67	4.5686384

BOERNE, KENDALL COUNTY.

On a high hill in Mr. Dieter's pasture, about 3 miles south of Boerne.

Station mark: A bronze tablet cemented into limestone rock.

Reference mark: U | S cut on flat limestone east of fence and south of rock pile.

[Latitude, 29° 45′ 27.24″. Longitude, 98° 45′ 30.75″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Smith	2 57 14.20	182 57 06.84	3.8893707
Bulverde	278 37 09.31	98 47 09.48	4.5171530
Leon	297 53 49.48	117 59 42.07	4.3353468

SMITH, BEXAR COUNTY.

On the east end of the highest long hill on divide between St. Geronimo and Balconne creeks, 2 miles north of Heimsath ranch, 2 miles south of the old Rigselworth ranch, about 7 miles south of Boerne, and 5 miles east of Gallagher post-office.

Station mark: A bronze tablet cemented into the limestone rock.

Reference mark: Cross (+) chiseled on the limestone rock.

[Latitude, 29° 41′ 15.83″. Longitude, 98° 45′ 45.60″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Wurzbach	15 21 54.20	195 19 33.63	4.4620990
Gallagher	42 42 25.92	222 39 53.82	4.0862998
Boerne	182 57 06.84	2 57 14.20	3.8893707
Bulverde	265 07 06.84	85 17 13.73	4.5190982
Leon	276 57 51.88	97.03 51.43	4.2938889
Gambrills	320 09 12.67	140 15 01.49	4.4728825
Helotes	344 53 40.75	164 54 32.71	4.0353926

WURZBACH, MEDINA COUNTY.

On a hill in Louis Wurzbach's pasture, 3 miles northeast of the St. Geronimo schoolhouse, about 5 miles northeast of the junction of Geronimo and Medina rivers, and about 6 miles north of Castroville. The San Antonio road from the schoolhouse, via Louis Wurzbach's ranch, passes about 1 mile south of station.

Station mark: An iron bench-mark post.

Reference mark: Cross (+) chiseled on rock at north end of hill.

[Latitude, 29° 26′ 18.14″. Longitude, 98° 50′ 30.50″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Schmidt	65 22 32.39	245 17 46.44	4.2375488
Peachtree	119 39 59.72	299 31 42.62	4.4950606
Gallagher	178 09 58.25	358 09 47.12	4.2785213
Smith	195 19 33.63	15 21 54.20	4.4620990
Helotes	210 58 57.28	31 02 09.39	4.3093254
Gambrills	259 04 49.75	79 12 57.35	4.4346176

GALLAGHER, BEXAR COUNTY.

Near the center of summit of a prominent peak 2 miles west of the old Gallagher ranch and about 2 miles south of Gallagher post-office.

Station mark: A bronze tablet cemented into a large bowlder.

Reference mark: Cross (+) chiseled in limestone rock.

[Latitude, 29° 26′ 24.60″. Longitude, 98° 50′ 53.08″.]

To station—	Azimuth.			Back azimuth.			Log. distance.
	°	′	″	°	′	″	*Meters.*
Schmidt	29	58	25.87	209	53	50.25	4.4803408
Peachtree	82	28	42.75	262	20	35.50	4.4279650
Helotes	277	42	24.31	97	45	48.09	4.0493358
Gambrills	296	50	34.25	116	58	54.27	4.4859784
Wurzbach	358	09	47.12	178	09	58.25	4.2785213
Smith	222	39	53.82	42	42	25.92	4.0862998

SCHMIDT, MEDINA COUNTY.

In a pasture belonging to E. H. Schmidt, and about one-fourth mile south of his house, 3 miles north of Dunlay post-office, 3 miles southeast of Quihi post-office, and 10 miles east of Hondo, and one-half mile south of the San Antonio-Castroville-Hondo road.

Station mark: A bronze tablet cemented in rock.

[Latitude, 29° 22′ 13.93″. Longitude, 99° 00′ 12.95″.]

To station—	Azimuth.			Back azimuth.			Log. distance.
	°	′	″	°	′	″	*Meters.*
Fohn	62	18	07.37	242	11	32.16	4.3911020
Hackberry	126	45	25.80	306	36	14.88	4.5754278
Peachtree	153	06	42.00	333	03	11.98	4.4049270
Gallagher	209	53	50.25	29	58	25.87	4.4803408
Wurzbach	245	17	46.44	65	22	32.39	4.2375488

PEACHTREE (ROUND MOUNTAIN), MEDINA COUNTY.

A high and very prominent mountain, about 20 miles north of Hondo and 13 miles south and a little west of Bandera, 1½ miles west of the Peachtree water hole and 3 miles west of Jack Hayes's ranch, on the Hondo-Bandera road.

Station mark: A bronze tablet cemented into limestone rock.

Reference mark: $\begin{array}{c|c} U & S \\ \hline G & S \end{array}$ chiseled on rock.

[Latitude, 29° 34′ 29.68″. Longitude, 99° 07′ 19.83″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Fohn	16 44 59.05	196 41 52.27	4.5516842
Hackberry	89 29 40.15	269 23 58.15	4.2707209
Gallagher	262 20 35.50	82 28 42.75	4.4279650
Wurzbach	299 31 42.62	119 39 59.72	4.4950606
Schmidt	333 03 11.98	153 06 42.00	4.4049270

FOHN, MEDINA COUNTY.

On a high brushy hill 8 miles southeast of D'Hanis and about 10 miles southwest of Hondo, in Mr. Fohn's pasture. A half mile west of his house a wagon road passes less than one-half mile from station on east and south side of hill.

Station mark: An iron bench-mark post.

Reference mark: A buried broken bottle.

[Latitude, 29° 16′ 01.72″. Longitude, 99° 13′ 40.06″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Irishman	60 35 05.80	240 29 38.60	4.3178830
Crane	142 12 15.07	322 05 04.36	4.5859333
Hackberry	166 04 14.12	346 01 40.53	4.5436202
Peachtree	196 41 52.27	16 44 59.05	4.5516842
Schmidt	242 11 32.16	62 18 07.37	4.3911020

HACKBERRY, MEDINA COUNTY.

On a high knob on spur from south face of divide between the Hondo and Seco rivers, about 25 miles northeast of Sabinal and about 22 miles northwest of Hondo. The Sabinal-Bandera road (old Uvalde-Bandera road) passes 1 mile south, then bends and passes 1½ miles east of station. The station is about 5 miles southwest of H. Rothes's lower ranch, on the Hondo River, and about 4 miles south and west of where the Sabinal-Bandera road intersects the Hondo Canyon road.

Station mark: A copper bolt stamped $\overset{\text{S G}}{\text{U}\ \triangle\ \text{S}}$.

[Latitude, 29° 34′ 23.84″. Longitude, 99° 18′ 52.76″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Irishman	12 20 33.45	192 17 38.07	4.6551277
Crane	77 03 55.48	256 59 16.97	4.1930340
Peachtree	269 23 58.15	89 29 40.15	4.2707209
Schmidt	306 36 14.88	126 45 25.80	4.5754278
Hondo	325 37 41.02	145 42 48.67	4.4754826
Fohn	346 01 40.53	166 04 14.12	4.5436202

IRISHMAN, UVALDE COUNTY.

A prominent point, locally known as Irishman Hill, about 10 miles south of Sabinal and 3 miles east of the Friotown-Sabinal road.

Station mark: The iron bench-mark post of the United States Geological Survey, sunk 40 inches in clay and stone.

Reference mark: A quart bottle buried 8 inches below the surface of the ground and covered by a mound of stone, 7.88 feet distant.

[Latitude, 29° 10′ 29.58″. Longitude, 99° 24′ 50.31″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Blue	120 09 23.32	300 01 58.28	4.4538866
Florea	146 47 13.53	326 39 44.99	4.6532266
Peters	155 41 21.42	335 36 13.07	4.6145018
Crane	172 11 37.10	352 09 55.60	4.6131922
Hackberry	192 17 38.07	12 20 33.46	4.6551277
Fohn	240 29 38.60	60 35 05.80	4.3178830

CRANE, UVALDE COUNTY.

This station may be reached from Sabinal by taking Utopia road to a point near the 7-mile post from Utopia; then by road leading east across Sabinal Creek to house of Mr. Crane, about 1½ miles distant; then up ravine about a mile, and from thence on foot to top of highest peak in vicinity. Station is about 20 feet from northwest edge of hill.

Station mark: A copper bolt leaded into solid limestone rock, which is here about 10 inches below surface of ground, and above which is placed a limestone rock with a cross cut on it.

Reference mark: An arrow cut in rock, 15.69 feet distant southwest of station.

[Latitude, 29° 32′ 30.12″. Longitude, 99° 28′ 17.35″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Blue	35 45 47.96	215 40 02.08	4.5120465
Peters	74 30 32.62	254 27 04.55	4.0718414
Hackberry	256 59 16.97	77 03 55.48	4.1930340
Fohn	322 05 04.36	142 12 15.07	4.5859333
Irishman	352 09 55.60	172 11 37.10	4.6131922

ARIZONA.

In the spring of 1899 A. H. Thompson extended triangulation over the square degree between latitudes 33° and 34° and longitudes 111° and 112°; also over the Globe 15′ quadrangle, occupying in all seventeen stations. He selected a site for a base line 5 miles in length along the Southern Pacific Railroad southeast of Maricopa. This base was measured twice at night with 300-foot tape by Mr. T. M. Bannon in the winter of 1899–1900.

Positions are dependent upon the astronomic pier located by the United States Coast and Geodetic Survey at Maricopa in October, 1899. The meridian established by that survey was used as the initial azimuth. A check azimuth was observed by Mr. T. M. Bannon at azimuth station near Globe. Mr. Bannon also extended the triangulation eastward from Globe, occupying seven new stations not included herewith.

Base Line.

MARICOPA, PINAL COUNTY.

Measured along the end of the railroad ties of the Southern Pacific Railroad, commencing opposite milepost 897, about 3,900 feet east of Maricopa station, thence running eastward to a point opposite milepost 902.

The line was prepared in the usual manner by nailing boards across the ties, on each of which a strip of zinc was nailed. Three hundred-foot steel tape No. 1 was used under a tension of 20 pounds, and temperature was read with 2 thermometers at each tape length. Adopted length of tape, 300.0106 feet.

Difference of 2 measurements, 0.006 foot.

Adopted length of base, 26,476.477 feet.

Reduced to log. of meters = 3.9068760.

Triangulation Stations.

BLACKHAWK BUTTE, GILA COUNTY.

On a sharp peak about 3 miles north of Globe and about 1 mile north of the Gubright and Gray mines. The summit of the peak is a mass of angular rocks. The broken mass slopes to the northeast and forms a dark black cap to the peak.

Station mark: An aluminum bench-mark tablet set in one of the largest masses of the rock, over which a rock cairn 6 feet high was built.

[Latitude, 33° 26′ 09.23″. Longitude, 110° 46′ 02.26″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Pinal Mountain	21 59 04.14	201 56 47.11	4.2360815
Kings Crown	67 36 41.67	247 26 38.89	4.4863164
Four Peaks	117 59 50.15	297 41 17.86	4.7686153

PINAL MOUNTAIN, GILA COUNTY.

On the northwest high point of Pinal Mountain.

Station mark: An aluminum bench-mark tablet set in a large rock.

Reference mark: A trimmed dead tree 9¾ feet distant from the station.

[Latitude, 33° 17′ 30.80″. Longitude, 110° 50′ 11.44″.]

To station.	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Grayback	45 37 11.87	225 28 34.73	4.5351619
Kings Crown	101 04 26.85	280 56 42.07	4.3483688
Four Peaks	133 45 53.99	313 29 41.28	4.7985016
Blackhawk Butte	201 56 47.11	21 59 04.14	4.2360815

KINGS CROWN, PINAL COUNTY.

On a craggy heap of rock known as Kings Crown, on the highest part of the mountain overlooking Queens Crown and about 1 mile east of Silver King mine.

Station mark: An aluminum bench-mark tablet set in solid rock. A rock cairn 5 feet in diameter at the base and 8 feet high was erected over the mark.

[Latitude, 33° 19′ 49.05″. Longitude, 111° 04′ 17.75″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Santan Peak	73 45 42.33	253 24 42.59	4.7923897
Grayback	5 09 55.31	185 09 01.35	4.4531293
Walker Butte	54 33 10.04	234 18 35.51	4.7063963
Superstition Point	106 06 40.73	285 55 47.87	4.5041093
Four Peaks	148 54 38.71	328 46 12.70	4.6601380
Blackhawk Butte	247 26 38.89	67 36 41.67	4.4863164
Pinal Mountain	280 56 42.07	101 04 26.85	4.3483688

GRAYBACK, PINAL COUNTY.

About 3 miles north of the Florence and Riverside road and about 18 miles from Florence, on the eastern and highest part of the summit of the isolated butte known locally as Grayback.

Station mark: An aluminum bench-mark tablet set in solid rock, over which a rock cairn 8 feet high was built.

[Latitude, 33° 04′ 31.32″. Longitude, 111° 05′ 56.29″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Walker Butte	88 10 45.30	267 57 07.51	4.5899323
Superstition Point	142 51 12.97	322 41 16.33	4.6681408
Kings Crown	185 09 01.35	5 09 55.31	4.4531293
Pinal Mountain	225 28 34.73	45 37 11.87	4.5351619

FOUR PEAKS, MARICOPA COUNTY.

On the northwestern part of the mountain known as Four Peaks, the highest southern point of the Mazatzal Range. It is about 30 miles east of Camp McDowell and 12 miles west of Tonto Creek. There is a good spring in the pass north of the station, 2,500 feet below the summit.

Station mark: An aluminum bench-mark tablet set in solid rock, over which a rock cairn 8 feet high was erected.

[Latitude, 33° 40′ 59.08″. Longitude, 111° 19′ 34.37″.][1]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Superstition Point	12 58 32.17	192 56 02.79	4.4928818
Camels Back	72 29 38.43	252 08 31.69	4.7920313
Black Mesa	113 54 19.75	293 32 30.56	4.8203147
Mazatzal[2]	163 22 27.06	343 17 54.69	4.6414914
Blackhawk Butte	297 41 17.86	117 59 50.15	4.7686153
Pinal Mountain	313 29 41.28	133 45 53.99	4.7985016
Kings Crown	328 46 12.70	148 54 38.71	4.6601380

[1] United States Geological Survey Bulletin No. 122, page 376, gives this position as, latitude, 33° 41′ 04.20″; longitude, 111° 19′ 29.6–″. The position as given above is, however, considered more nearly correct and less affected by station error.

[2] Bulletin No. 122 gives the bearing of this station as, azimuth, 163° 22′ 45.7″; back azimuth, 343° 17′ 13.2″; log. distance, 4.6413886 meters.

SUPERSTITION POINT, PINAL COUNTY.

On a high, sharp point on the eastern end of Superstition Mountain, probably the highest point on the mountain, which is almost inaccessible except from the southern face.

Station mark: An aluminum bench-mark tablet set in solid rock. A rock cairn 5 feet at the base and 7 feet high was erected over the mark.

[Latitude, 33° 24′ 35.04″. Longitude, 111° 24′ 04.70″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Walker Butte	15 29 48.87	195 26 03.97	4.6003037
Santan Peak	47 35 09.45	227 24 57.87	4.5907680
Telegraph Pass	82 15 21.70	261 53 29.83	4.7941253
Camels Back	102 35 41.27	282 17 08.13	4.7274397
Black Mesa	136 50 47.99	316 31 33.30	4.8933470
Four Peaks	192 56 02.79	12 58 32.17	4.4928818
Kings Crown	285 55 47.87	106 06 40.73	4.5041093
Grayback	322 41 16.33	142 51 12.97	4.6681408

MAZATZAL, YAVAPAI COUNTY (not occupied).

On the highest point of the northern group of the Mazatzal Mountains, west of Tonto Basin.

Station mark: A small pile of stones.

[Latitude, 34° 03′ 41.04″. Longitude, 111° 27′ 43.07″.][1]

To Station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Black Mesa	72 20 53.16	252 03 30.73	4.7012139
Four Peaks[2]	343 17 54.69	163 22 27.06	4.6414914

[1] Bulletin No. 122, page 376: Latitude, 34° 03′ 45.7″; longitude, 111° 27′ 38.5″.

[2] Bulletin No. 122 gives, azimuth, 343° 17′ 18.2″; back azimuth, 163° 22′ 45.7″; log. distance, 4.6413886 meters.

WALKER BUTTE, PINAL COUNTY.

On a high conical butte near the Gila River and about 8 miles west of Florence, Arizona.

Station mark: An aluminum bench-mark tablet, over which a rock cairn 8 feet high was built.

[Latitude, 33° 03′ 48.70″. Longitude, 111° 30′ 55.02″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sacaton Butte	91 16 07.00	271 03 35.02	4.5533797
Santan Peak	123 39 53.19	303 33 30.61	4.3384190
Superstition Point	195 26 03.97	15 29 48.87	4.6003037
Kings Crown	234 18 35.51	54 33 10.04	4.7063963
Grayback	267 57 07.51	88 10 45.30	4.5899323

SANTAN PEAK, PINAL COUNTY.

On the highest point of the Chiloscome Range, about 6 miles northwest of the Sacaton Agency, and about 400 feet south of a rounded point which forms part of the same mountain.

Station mark: An aluminum bench-mark tablet set in solid rock, over which a rock cairn was built.

[Latitude, 33° 10′ 20.39″. Longitude, 111° 42′ 35.25″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sacaton Butte	57 13 16.97	237 07 06.52	4.3204982
Pima Butte	84 18 49.54	264 08 39.18	4.4633464
Telegraph Pass	118 22 24.17	298 10 45.37	4.5735616
Camels Back	148 14 05.41	328 05 46.17	4.6486374
Superstition Point	227 24 59.88	47 35 09.46	4.5907680
Walker Butte	303 33 30.61	123 39 53.19	4.3384190
Kings Crown	253 24 42.59	73 45 42.33	4.7923897

SACATON BUTTE, PINAL COUNTY.

On a low butte about 8 miles east of Maricopa station, on the Southern Pacific Railroad. Counting from the west, it is the fourth in a line of low buttes, and is the highest of the group.

Station mark: An aluminum bench-mark tablet set in solid rock, over which a rock cairn 7 feet high was built.

[Latitude, 33° 04′ 12.28″. Longitude, 111° 53′ 53.23″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Southeast base	42 51 18.35	222 48 59.70	3.9870393
Papago Butte	69 31 01.00	249 23 02.23	4.3863488
Northwest base	79 50 31.91	259 45 56.19	4.1246015
Astronomic pier	84 43 12.45	264 38 11.84	4.1570151
Pima Butte	126 35 08.32	306 31 09.13	4.1502593
Telegraph Pass	152 04 14.57	331 58 47.96	4.5176413
Santan Peak	237 07 06.52	57 13 16.97	4.3204982
Walker Butte	271 03 35.02	91 16 07.00	4.5533797

CAMELS BACK, MARICOPA COUNTY.

Near the southeast corner of sec. 7, T. 2 N., R. 3 E., about 10 miles northeast of Phœnix station, on the highest point of a scraggy mountain known as Camels Back.

Station mark: A bronze tablet cemented in solid rock, over which is built a mound of stone 8 feet high.

Reference marks: North mark, cross cut in stone 14.5 feet distant; east mark, cross cut in stone 7.6 feet distant.

[Latitude, 33° 30′ 48.34″. Longitude, 111° 57′ 43.54″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Telegraph Pass	25 14 51.20	205 11 29.52	4.3463716
Black Mesa	177 55 29.23	357 54 53.64	4.6575051
Four Peaks	252 08 31.69	72 29 38.43	4.7920313
Superstition Point	282 17 08.13	102 35 41.27	4.7274397
Santan Peak	328 05 46.17	148 14 05.41	4.6486374

MARICOPA SOUTHEAST BASE, PINAL COUNTY.

On north side of the railroad about 5½ miles southeast from Maricopa, 26 feet from the center of the railroad track and 27 feet east of milepost 902. Theodolite elevated 14 feet.

Station mark: The cross on an iron bench-mark post, set flush with the ground and surrounded by a collar of cement. A large flat rock was placed underneath the post.

[Latitude, 33° 00′ 21.24″. Longitude, 111° 58′ 07.54″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Papago Butte	85 00 47.83	264 55 07.98	4.2111664
Northwest base	126 09 21.11	306 07 04.23	3.9068760
Pima Butte	162 58 21.78	342 56 41.59	4.2108090
Sacaton Butte	222 48 59.70	42 51 18.35	3.9870393

BLACK MESA, MARICOPA COUNTY.

About 200 feet northwest of the highest point on a rounded butte, at the southern extremity of what is locally known as Black Mesa. It is a little north of west and about 4 miles distant from the Phœnix mine, on Cure Creek. There is a large cedar tree near the north side of the station.

Station mark: An aluminum bench-mark tablet set in a large rock and buried below the surface of the ground. The surface mark is a pile of stones 4 feet high.

[Latitude, 33° 55′ 22.47″. Longitude, 111° 58′ 47.60″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mazatzal	252 03 30.73	72 20 53.16	4.7012139
Four Peaks	293 32 30.56	113 54 19.75	4.8203147
Superstition Point	316 31 33.30	136 50 47.99	4.8933470
Camels Back	357 54 53.64	177 55 29.23	4.6575051

PIMA BUTTE, PINAL COUNTY.

On the eastern and highest point of the butte, 1 mile south of Sacaton station, on the Southern Pacific Railroad.

Station mark: An aluminum bench-mark tablet set in solid rock. A rock cairn 8 feet high was built over the tablet.

[Latitude, 33° 08′ 45.52″. Longitude, 112° 01′ 11.13″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Northwest base	9 14 17.95	189 13 41.06	4.0381178
Astronomic pier	16 45 03.81	196 44 02.04	4.0077672
Papago Butte	33 59 39.80	213 55 39.48	4.3106994
Telegraph Pass	168 46 43.02	348 45 16.11	4.3237023
Santan Peak	264 08 39.18	84 18 49.54	4.4633464
Sacaton Butte	306 31 09.14	126 35 08.32	4.1502593
Southeast Base	342 56 41.59	162 58 21.78	4.2108090

MARICOPA NORTHWEST BASE, PINAL COUNTY.

On the north side of the railroad, opposite milepost 897, about one-half mile southeast of Maricopa station and 26 feet from the center of the railroad track. Theodolite elevated 14 feet.

Station mark: The cross on an iron bench-mark post set flush with the ground and surrounded by a collar of cement. The bottom of the post is set on a rock.

[Latitude, 33° 02′ 55.72″. Longitude, 112° 02′ 18.68″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Papago Butte	57 26 25.02	237 23 01.84	4.0601435
Pima Butte	189 13 41.06	9 14 17.95	4.0381178
Sacaton Butte	259 45 56.19	79 50 31.92	4.1246015
Southeast base	306 07 04.23	126 09 21.13	3.9068760

TELEGRAPH PASS, MARICOPA COUNTY.

On the highest point of the mountains southeast of Phœnix and about one-half mile east of Telegraph Pass.

Station mark: An aluminum bench-mark tablet set in a large rock, over which was built a rock cairn 7 feet high.

[Latitude, 33° 19′ 56.41″. Longitude, 112° 03′ 49.68″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Papago Butte	11 00 19.18	190 57 45.00	4.5835635
Camels Back	205 11 29.52	25 14 51.20	4.3463716
Superstition Point	261 53 29.83	82 15 21.70	4.7941253
Santan Peak	298 10 45.37	118 22 24.17	4.5735616
Sacaton Butte	331 58 47.96	152 04 14.57	4.5176413
Pima Butte	348 45 16.11	168 46 43.02	4.3237023

PAPAGO BUTTE, PINAL COUNTY.

On an almost isolated butte, about 7 miles a little west of south from Maricopa station, on the Southern Pacific Railroad.

Station mark: An aluminum bench-mark tablet cemented in solid rock, over which a rock cairn 8 feet high was built.

[Latitude, 32° 59′ 34.92″. Longitude, 112° 08′ 31.54″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Telegraph Pass	190 57 45.00	11 00 19.18	4.5835635
Pima Butte	213 55 39.49	33 59 39.80	4.3106994
Astronomic pier	229 38 23.19	49 41 21.58	4.0470316
Northwest base	237 23 01.84	57 26 25.02	4.0601435
Sacaton Butte	249 23 02.23	69 31 01.00	4.3863488
Southeast base	264 55 07.98	85 00 47.83	4.2111664

Secondary Positions.

The following positions were computed from two or more unclosed triangles from primary stations:

Geographic positions in Arizona.

Position.	Latitude.	Longitude.
GILA COUNTY.	° ′ ″	° ′ ″
Globe Butte	33 26 59.30	100 47 01.31
Central point of Pinal Mountain	33 17 04.59	110 49 35.78
Sierra Ancha Head, a rounded butte	33 48 42.85	110 54 16.19
Apache Peak, western and highest peak	33 32 21.30	111 44 35.25
PINAL COUNTY.		
Hattons Peak, summit of mountain	33 20 31.35	110 58 47.24
South Butte	33 04 51.68	111 11 42.10
North Butte	33 06 17.05	111 11 55.60
Mineral Mountain	33 10 18.87	111 14 14.03
Weavers Needle	33 25 57.41	111 22 23.30
Cupola of courthouse, Florence	33 01 57.27	111 23 31.90
Postern Butte	33 03 14.37	111 24 34.22
Superstition, west peak	33 26 17.47	111 26 57.46
Flag pole on agent's quarters, Sacaton Agency	33 04 42.23	111 43 49.72
MARICOPA COUNTY.		
Arizona dam, butte	33 32 21.03	111 41 39.56
McDowell Mountain	33 38 33.70	111 48 46.82
Gila Butte	33 09 16.16	111 51 44.95
Tempe Butte	33 25 45.20	111 55 59.44
Phœnix water tower	33 27 03.26	112 03 44.31
Phœnix, pole on top of cupola of courthouse	33 26 50.35	112 04 35.12

PACIFIC SECTION OF TOPOGRAPHY.

UTAH.

Triangulation Stations.

Three stations located by the three-point method for the control of the Bingham, Utah, special map, from United States Coast and Geodetic Survey stations Deseret and Nebo, and United States Geological Survey station Spanish Fork, by Mr. R. U. Goode, geographer, with an 8-inch vernier theodolite.

FREEMAN, UTAH COUNTY.

On most western of three points, locally known as Mahogany Mountain, on ridge from main crest between Freeman and Dry canyons, about 2 miles northwest from town of Bingham.

Station mark: Rock cairn.

[Latitude, 40° 33′ 22.14″. Longitude, 112° 10′ 08.29″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Deseret	74 28 50.74	254 10 59.38	4.6056666
Nebo	337 27 17.71	157 42 50.83	4.9529049

BINGHAM, UTAH COUNTY.

On point on summit of Oquirrh Mountains, south of and about one-fourth mile from wagon road which crosses main divide from Bingham Canyon by way of United States mine to Middle Fork. The station is on the eastern one of two summits.

Station mark: Rock cairn.

[Latitude, 40° 29′ 55.05″. Longitude, 112° 10′ 35.45″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Deseret	83 25 19.97	263 07 46.87	4.5851959
Nebo	335 22 46.17	155 38 36.25	4.9249196

MARKHAM, UTAH COUNTY (not occupied).

On a high point locally known as Clipper Mountain, about 1 mile north from Bingham triangulation station, north of the wagon road which crosses main divide from Bingham Canyon by way of United States mine to Middle Fork.

Station mark: A small tree guyed by wire.

[Latitude, 40° 30′ 43.90″. Longitude, 112° 11′ 17.65″.]

To station—	Log. distance.
	Meters.
Bingham	3.2558415
Freeman	3.7114306

EASTERN WASHINGTON.

Triangulation Stations.

The following positions are based on Carlton and Tompkinson stations of the Spokane base expansion, and were determined during the field season of 1899 by Mr. C. F. Urquhart, topographer. They lie partly within and partly without the Colville Indian Reservation, in the northeastern part of the State.

CALISPELL, STEVENS COUNTY.

On the highest peak of the Calispell Range, and nearly 15 miles northeast of Chewelah, and about 10 miles northwest of Calispell Lake. It can be reached from Calispell Lake via Sheepmens trail, and from Chewelah via road up Chewelah Creek to its source, then over mountains.

Station mark: A rock cairn 8 feet at the base and 8 feet high.

[Latitude, 48° 26′ 11.57″. Longitude, 117° 30′ 13.96″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Scoop	13 17 09.23	193 09 22.66	4.7522781
Chewelah	16 56 58.23	196 54 51.04	4.2483135
Huckleberry	52 01 22.79	231 39 32.26	4.6626862
Whitestone	58 42 55.13	237 57 51.53	4.9439519
Paint Rock	89 32 00.95	268 47 13.48	4.8683346
Daisy	98 18 32.02	277 53 13.53	4.6242330
Old Dominion	131 26 07.58	311 15 06.21	4.3827290
Carlton	333 09 40.67	153 27 01.54	4.8077336

CHEWELAH, STEVENS COUNTY.

About 7 miles east of Chewelah, a town on the Spokane Falls and Northern Railway. The trail from Chewelah to Calispell Lake passes about 25 yards south from station, at point where it crosses the highest part of mountains.

Station mark: A rock cairn 7 feet in diameter at the base and 8 feet high.

[Latitude, 48° 17′ 02.93″. Longitude, 117° 34′ 24.45″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Scoop	11 33 54.68	191 29 15.14	4.5896000
Huckleberry	69 52 51.62	249 34 09.44	4.5198157
Daisy	122 12 10.15	301 50 00.72	4.6349587
Old Dominion	158 29 56.47	338 22 03.28	4.5486211
Calispell	196 54 51.04	16 56 58.23	4.2483135
Carlton	319 42 24.42	140 02 50.50	4.7233072
Tompkinson	352 01 02.71	172 06 12.34	4.7959928

SCOOP, SPOKANE COUNTY.

On a small mountain known locally as "Old Scoop." This is the most southern of three rather prominent peaks about 10 miles southwest from Deer Park, a town on the Spokane Falls and Northern Railway. The road down the Spokane River from Spokane passes about 3½ miles south from station at point about 22 miles from Spokane. There is also a road from Deer Park to foot of hills.

Station mark: A fir tree about 60 feet high.

Reference mark: An aluminum bolt marked $\overset{\text{U. S.}}{\underset{\text{G. S.}}{\triangle}}$ set in rock 20.17 feet S. 13° 05′ E. from tree.

[Latitude, 47° 56′ 29.88″. Longitude, 117° 40′ 39.93″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Whitestone	98 27 02.70	277 49 54.64	4.7981273
Paint Rock	131 40 19.53	311 03 28.90	4.9118713
Huckleberry	138 49 20.00	318 35 20.14	4.5492979
Chewelah	191 29 15.14	11 33 54.68	4.5896000
Calispell	193 09 22.66	13 17 09.23	4.7522781
Chimney	223 12 19.18	43 57 37.43	5.0368169
Carlton	272 59 53.37	93 24 54.88	4.6237816
Tompkinson	325 16 00.80	145 25 47.90	4.4619607

OLD DOMINION, STEVENS COUNTY.

On the highest point of a very prominent mountain known locally as the "Old Dominion Mountain." About 7 miles east from Colville, a town on the Spokane Falls and Northern Railway. The road from Colville to the Old Dominion mine goes to the mountain.

Station mark: A rock cairn 7 feet at base and 8 feet high.

[Latitude, 48° 34′ 47.82″. Longitude, 117° 44′ 56.92″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Huckleberry	22 06 50.06	201 55 58.12	4.6799201
Whitestone	42 35 45.56	222 01 38.20	4.9240124
Daisy	67 02 15.66	246 47 57.14	4.4073656
Paint Rock	73 15 26.74	252 41 37.62	4.7646207
Summit	90 28 20.92	269 55 17.03	4.7341984
St. Peter	111 36 46.30	291 04 03.53	4.7589722
Calispell	311 15 06.21	131 26 07.58	4.3827290
Chewelah	338 22 03.28	158 29 56.47	4.5486211

HUCKLEBERRY, STEVENS COUNTY.

About 5 miles southwest from Suter's ranch, on the highest peak of the Huckleberry Mountains.

Station mark: A rock cairn 7 feet at the base and 8 feet high.

[Latitude, 48° 10′ 51.59″. Longitude, 117° 59′ 28.98″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Whitestone	65 35 13.40	245 12 01.54	4.6289239
Paint Rock	126 01 14.34	305 38 22.65	4.6692623
Summit	140 51 36.99	320 29 31.14	4.7603296
Daisy	170 42 39.67	350 39 15.26	4.5416481
Old Dominion	201 55 58.12	22 06 50.06	4.6799201
Calispell	231 39 32.26	52 01 22.79	4.6626862
Chewelah	249 34 09.44	69 52 51.62	4.5198157
Carlton	293 36 20.98	114 15 25.06	4.8537564
Scoop	318 35 20.14	138 49 20.00	4.5492979

DAISY, STEVENS COUNTY.

On the range of mountains between the Columbia and Colville rivers. The "Old Daisy" trail between Colville and Daisy post-office crosses ridge about 4 miles south from station.

Station mark: A stone marked $\overset{\text{U. S.}}{\underset{\text{G. S.}}{+}}$ under center of a rock monument 8 feet in height.

[Latitude, 48° 29′ 23.56″. Longitude, 118° 04′ 02.60″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Whitestone	32 28 37.61	112 08 46.53	4.7896032
Paint Rock	77 50 53.68	257 31 23.49	4.5169067
Summit	108 30 00.55	288 11 16.57	4.5107761
St. Peter	135 56 58.03	315 38 36.40	4.6346233
Old Dominion	246 47 57.14	67 02 15.66	4.4073656
Calispell	277 53 13.53	98 18 32.02	4.6242330
Chewelah	301 50 00.72	122 12 10.15	4.6349587
Huckleberry	350 39 15.26	170 42 39.67	4.5416481

ST. PETER, FERRY COUNTY.

On the east end of the high timbered mountain near the head of St. Peters Creek. All timber cut so as to leave an unobstructed view in every direction except northwest.

Station mark: An aluminum bolt marked $\overset{\text{U. S.}}{\underset{\text{G. S.}}{\triangle}}$ set in rock, with a rock cairn 7 feet at the base and 8 feet high erected over it.

[Latitude, 48° 46′ 04.14″. Longitude, 118° 28′ 30.60″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Summit	1 48 35.72	181 48 11.75	4.3162925
Fir	71 31 35.60	251 10 47.47	4.5542887
Bonaparte	92 32 36.83	272 03 21.31	4.6784456
Teroda	104 09 54.01	283 53 41.53	4.4344046
Old Dominion	291 04 03.53	111 36 46.30	4.7589722
Daisy	315 38 36.40	135 56 58.03	4.6346233

SUMMIT, FERRY COUNTY.

About 14 miles a little south of east from Republic, about 2½ miles south from Kettle Falls and Republic trail, at point where trail crosses the mountains, locally known as "The Summit." It is on the second peak south from trail.

Station mark: A rock cairn 7 feet at the base and 8 feet high.

[Latitude, 48° 34′ 53.85″. Longitude, 118° 29′ 02.52″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Paint Rock	4 20 14.77	184 19 27.20	4.2371381
Moses	61 34 19.69	241 08 20.14	4.6879590
Fir	105 39 47.38	285 19 24.98	4.5393192
Republic	109 22 23.49	289 12 14.07	4.2462720
Bonaparte	115 53 48.92	295 24 59.86	4.7179974
St. Peter	181 48 11.75	1 48 35.72	4.3162925
Old Dominion	269 55 17.03	90 28 20.92	4.7341984
Daisy	288 11 16.57	108 30 00.55	4.5107761
Huckleberry	320 29 31.14	140 51 36.99	4.7603296

PAINT ROCK, FERRY COUNTY.

On a prominent rocky peak near the head of Hall Creek, about 14 miles south from point where Kettle Falls and Republic trail crosses "The Summit."

Station mark: An aluminum bolt marked $\overset{\text{U. S.}}{\underset{\text{G. S.}}{\triangle}}$ set in solid rock, with a rock cairn 8 feet at the base and 8 feet high erected over it.

[Latitude, 48° 25′ 36.54″. Longitude, 118° 30′ 06.02″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Whitestone	0 52 03.14	180 51 38.59	4.6537670
Moses	81 46 57.74	261 21 47.56	4.6231881
Fir	129 39 19.97	309 19 46.64	4.6191842
Bonaparte	131 12 36.57	310 44 37.21	4.7835003
Summit	184 19 27.20	4 20 14.77	4.2371381
Old Dominion	252 41 37.62	73 15 26.74	4.7646207
Daisy	257 31 23.49	77 50 53.68	4.5169067
Calispell	268 47 13.48	89 32 00.95	4.8683346
Huckleberry	305 38 22.65	126 01 14.34	4.6692623
Scoop	311 03 28.90	131 40 19.53	4.9118713

WHITESTONE, FERRY COUNTY.

Eight miles east of Keller post-office, on a very prominent mountain known locally as Whitestone Mountain. Trail from Keller to the meadow on Ninemile Creek goes to foot of mountain, which can be easily ascended from the west side.

Station mark: An aluminum bolt marked $\overset{\text{U. S.}}{\underset{\text{G. S.}}{\triangle}}$ set in solid rock, with a rock cairn 6 feet at the base and 6 feet high erected over it.

[Latitude, 48° 01′ 17.94″. Longitude, 118° 30′ 38.95″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Moses	133 40 50.25	313 16 09.35	4.7523117
Paint Rock	180 51 38.59	0 52 03.14	4.6537670
Daisy	212 08 46.53	32 28 37.61	4.7896032
Old Dominion	222 01 38.20	42 35 45.56	4.9240124
Calispell	237 57 51.53	58 42 55.13	4.9439519
Huckleberry	245 12 01.54	65 35 13.40	4.6289239
Scoop	279 49 54.64	98 27 02.70	4.7981273

REPUBLIC, FERRY COUNTY.

On a bald hill 1½ miles southeast from town of Republic. To reach station go east on Little Falls and Republic road about 1½ miles; thence south and west to top of hill.

Station mark: An aluminum bolt marked $\overset{\text{U.S.}}{\underset{\text{G.S.}}{\triangle}}$ set in solid rock on the highest point of hill. A rock cairn 4 feet at base and 5½ feet high erected over bolt.

Preliminary location:

[Latitude, 48° 38′ 02.4″. Longitude, 118° 42′ 34.9″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Fir	101 39 31.00	281 29 18.00	4.232084
St. Peter	229 09 01.00	49 19 35.00	4.357779
Summit	289 12 14.00	109 22 23.00	4.246272

TERODA, FERRY COUNTY.

About 3 miles northeast from Bodie, Okanogan County, a small town and post-office on Teroda Creek. Trail running northeast from Bodie to a mining camp passes very near the station, which is on the east end of the highest mountain in the vicinity.

Station mark: An aluminum bolt marked $\overset{\text{U. S.}}{\underset{\text{G. S.}}{\triangle}}$ set in sold rock with a rock cairn 7 feet at the base and 7 feet high erected over it.

[Latitude, 48° 49′ 37.53″. Longitude, 118° 50′ 03.13″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Fir	22 40 34.18	202 35 57.19	4.2912672
Bonaparte	77 41 42.29	257 28 38.59	4.3376644
St. Peter	283 53 41.53	104 09 54.01	4.4344046

FIR, FERRY COUNTY.

On the rocky summit of a rather prominent mountain about 11 miles west from Republic. The Republic and Okanogan road passes about 2 miles north of station at point 11 miles distant.

Station mark: A fir tree 15 feet high, 50 yards south from highest point on mountain.

Reference mark: An aluminum bolt marked U. S. △ G. S. set in solid rock 19.33 feet distant, N. 37° 40′ W. (true) from tree.

[Latitude, 48° 39′ 53.24″. Longitude, 118° 56′ 11.56″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Moses	15 59 18.90	195 53 38.76	4.5304707
Bonaparte	134 15 27.53	314 07 01.70	4.2829262
Teroda	202 35 57.19	22 40 34.18	4.2912672
St. Peter	251 10 47.47	71 31 35.60	4.5542887
Republic	281 29 17.84	101 39 30.90	4.2320836
Summit	285 19 24.98	105 39 47.38	4.5393192
Paint Rock	309 19 46.64	129 39 19.97	4.6191842

MOSES, OKANOGAN COUNTY.

On a high timbered mountain, 12 or 15 miles northwest from Indian agency on Nespilem River, locally known as Moses Mountain. Trail up the Nespilem River passes about 4 miles east from station. The mountain is covered with dead timber.

Station mark: A pine tree about 20 feet high.

Reference mark: An aluminum bolt marked U. S. △ G. S. set in a large rock 28.5 feet distant N. 22° 20′ E. (true) from tree.

(Latitude, 48° 22′ 17.30″. Longitude, 119° 03′ 45.56″.)

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Bonaparte	174 26 46.28	354 24 02.01	4.6647018
Fir	195 53 38.76	15 59 18.90	4.5304707
Summit	241 08 20.14	61 34 19.69	4.6879590
Paint Rock	261 21 47.56	81 46 57.74	4.6231881
Whitestone	313 16 09.35	133 40 50.25	4.7523117

BONAPARTE, OKANOGAN COUNTY.

About 7 miles north from point where Republic and Okanogan road crosses Bonaparte Creek on a large mountain well known as Bonaparte Peak. A trail goes up Bonaparte Creek to foot of peak.

Station mark: A lone tree.

Reference mark: An aluminum bolt marked $\overset{\text{U. S.}}{\underset{\text{G. S.}}{\triangle}}$ set in solid rock 14.08 feet distant N. 26° 13′ W. (true) from tree.

[Latitude, 48° 47′ 06.10″. Longitude, 119° 07′ 24.62″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Teroda	257 28 38.59	77 41 42.29	4.3376644
St. Peter	272 03 21.31	92 32 36.83	4.6784456
Summit	295 24 59.86	115 53 48.92	4.7179974
Paint Rock	310 44 37.21	131 12 36.57	4.7835003
Fir	314 07 01.70	134 15 27.53	4.2829262
Moses	354 24 02.01	174 26 46.28	4.6647018

CENTRAL WASHINGTON.

Triangulation Stations.

During May and June, 1899, Mr. A. H. Sylvester, topographer, extended the triangulation southward from Manastash, Ellensburg Normal School, and Mount Aix stations, occupying in all 12 new stations.

In July, August, and September, triangulation of the previous year was extended to the northeast of Lake Chelan; 6 new stations and 5 stations of previous work were occupied.

MOUNT TIFFANY, OKANOGAN COUNTY.

On a round, double, bare-topped mountain in the main range between the Okanogan and Methow rivers, at the head of Boulder Creek, which is the first tributary of any size of the Chewach River above Winthrop. The station is on the higher and more southerly summit.

Station mark: A drill hole 6 inches deep in solid rock at highest point, over which was built a rock cairn 8 feet high.

[Latitude, 48° 40′ 04.97″. Longitude, 119° 55′ 47.37″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Lookout	25 33 02.46	205 21 34.27	4.6425013
Star	38 24 40.75	218 02 23.92	4.7730920
Gardner	66 25 51.38	246 00 50.42	4.6514757

CHELAN, OKANOGAN COUNTY.

On the highest butte south of Lake Chelan, on north side of Columbia River, about 2 miles west of Chelan River. A good trail from the post-office at Lakeside leads almost to summit.

Station mark: A copper bolt in solid rock.

[Latitude, 47° 48′ 18.96.″ Longitude, 120° 01′ 54.86.″]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stuart	60 50 48.86	240 12 19.28	4.8747277
Stormy	113 09 53.71	292 55 45.05	4.4126532
Pyramid	127 27 18.57	307 03 32.08	4.6998075
North Navarre	148 58 35.20	328 45 34.49	4.6250057
Cooper Mountain	170 36 32.45	350 34 18.09	4.3617212
Baldy	106 03 07.68	285 50 00.62	4.3610958

COOPER MOUNTAIN, OKANOGAN COUNTY.

On a large pyramidal rock, on a timbered mountain, about 5 miles northeast of the shore of Lake Chelan.

[Latitude, 48° 00′ 33.61″. Longitude, 120° 04′ 55.93″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Indian	20 29 53.08	200 26 30.71	4.2088432
Stormy	57 57 02.27	237 45 06.71	4.3731776
Chelan	350 34 18.09	170 36 32.45	4.3617212

LOOKOUT, OKANOGAN COUNTY.

On summit of Lookout Mountain, which lies on west side of Methow River, between Twisp and Lydle creeks, about 10 miles by trail from Twisp post-office.

Station mark: An aluminum bolt marked "U.S.G.S." set in solid rock, over which is a small rock cairn.

[Latitude, 48° 18′ 41.60″. Longitude, 120° 11′ 06.38″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
North Navarre	27 05 50.21	206 59 37.68	4.3556044
Star	68 51 05.66	248 40 18.49	4.2828245
Gardner	134 12 40.49	313 59 10.98	4.4913150
Mount Tiffany	205 21 34.27	25 33 02.46	4.6425013

HEMBREE, YAKIMA COUNTY.

On a prominent summit of Toppenish Ridge, 3 miles east of where the road from The Dalles and Goldendale to Yakima crosses the same. Summit is covered with drifting white sand.

Station mark: A copper bolt marked "U.S.G.S." set in a drill hole in a small bowlder which is set in the ground, over which is a rock cairn 6 feet high.

[Latitude, 46° 17′ 50.49″. Longitude, 120° 17′ 40.79″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Lone Pine	30 42 31.51	210 31 09.65	4.6004702
Granite	54 09 53.91	233 47 13.49	4.6992212
Satas	82 44 30.63	262 24 42.62	4.5501547
Cowiche	124 38 14.05	344 11 53.65	4.7515642
Atanum	136 52 01.43	316 39 09.72	4.5214435
Burge	145 18 49.56	324 57 15.15	4.8225851

NORTH NAVARRE, OKANOGAN COUNTY.

A round-topped peak, the highest at the head of Falls, Gold, and Safety Harbor creeks.

Station mark: A rock monument 6 feet high.

[Latitude, 48° 07′ 47.68″. Longitude, 120° 19′ 25.94″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stormy	4 16 50.43	184 15 40.87	4.4157205
Pyramid	72 19 24.70	252 08 36.94	4.2765735
Boston	127 23 16.21	306 51 21.30	4.8212967
Star	150 13 59.90	330 09 25.99	4.1838507
Lookout	206 59 37.68	27 05 50.21	4.3556044
Chelan	328 45 34.49	148 58 35.20	4.6250057

BALDY, OKANOGAN COUNTY.

A rocky butte at the head of First Creek, 5 miles west of Lake Chelan and 4 miles southeast of Stormy Mountain.

[Latitude, 47° 51′ 43.22″. Longitude, 120° 19′ 36.73″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stormy	155 44 25.03	335 43 23.62	3.6217930
Chelan	285 50 00.62	106 03 07.68	4.3610958

STORMY, OKANOGAN COUNTY.

On the highest timbered peak on the divide between the Antiat River and Lake Chelan and about 3 miles north of Baldy Mountain.

Station mark: Copper bolt set in bowlder.

[Latitude, 47° 53′ 46.77″. Longitude, 120° 20′ 59.53″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stuart	41 31 13.45	221 06 48.64	4.7964051
Columbia	95 44 04.90	274 59 08.45	4.8793095
Pyramid	141 31 25.28	321 21 48.25	4.4122297
Chelan	292 55 45.05	113 09 53.71	4.4126532
Star	171 48 10.25	351 44 46.47	4.5980310
North Navarre	184 15 40.87	4 16 50.43	4.4157205

STAR, OKANOGAN COUNTY.

A pointed rocky peak lying on the main divide between Lake Chelan and the Methow River, about east of the mouth of Railroad Creek on Lake Chelan.

Station mark: An aluminum bolt marked "U.S.G.S." set in solid rock, over which is a rock cairn 5 feet high.

[Latitude, 48° 14′ 56.67″. Longitude, 120° 25′ 33.43″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Pyramid	28 41 45.94	208 35 31.38	4.3358859
Boston	120 49 53.68	300 22 31.69	4.7204074
Gardner	171 11 25.40	351 08 44.43	4.4603010
Mount Tiffany	218 02 23.92	38 24 40.75	4.7730920
Lookout	248 40 18.49	68 51 05.66	4.2828245
North Navarre	330 09 25.99	150 13 59.90	4.1838507
Stormy	351 44 46.47	171 48 10.25	4.5980310

LONE GRAVE, YAKIMA COUNTY.

On the middle one of three small elevations, on a bare ridge called Toppenish Ridge, which extends east from the main range of the Cascades to the Yakima River, just south of the Toppenish Valley and Creek. Satas, Lone Grave, and Hembree stations (named in order from the west) are all located on this ridge.

Station mark: A copper bolt marked "U.S.G.S." set in drill hole in solid rock, over which is a rock cairn 9 feet high and 6 feet in diameter.

[Latitude, 46° 17′ 27.95″. Longitude, 120° 26′ 32.82″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Satas	80 49 46	260 36 22	4.38242
Cowiche	132 57 52	312 37 57	4.68104
Atanum	155 27 33	335 21 07	4.43749
Hembree	266 27 15	86 33 40	4.05729

CHUMSTICK, OKANOGAN COUNTY.

A round bare knob, the highest point of the ridge lying between the Chumstick and Entiat valleys. It is immediately at the head of Eagle Creek, a tributary of the Chumstick, and is about 2 miles south of point where the horse trail from Leavenworth to the Entiat crosses the ridge.

Station mark: An aluminum bolt marked "U.S.G.S." set in drill hole in small bowlder at foot of a living pine tree.

[Latitude, 47° 38′ 56.02″. Longitude, 120° 26′ 56.30″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Dirtyface	131 21 06.75	311 04 30.24	4.57131
Pyramid	169 40 46.51	349 35 35.17	4.68581
Stormy	195 04 16.62	15 08 40.77	4.45480
Chelan	240 47 23.56	61 05 54.52	4.55380

GARDNER, OKANOGAN COUNTY.

On the higher and more northerly of two peaks on a high mountain lying on the west side of the Methow River, between the headwaters of Early, Winters, and Wolf creeks, there is a sharp rocky peak about a mile to the north, a little higher than the station.

Station mark: Aluminum bolt marked "U.S.G.S." set in solid rock on highest point, and having built over it a rock cairn 7 feet high.

[Latitude, 48° 30′ 19.94″. Longitude, 120° 29′ 08.76″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Pyramid	7 08 00.14	187 04 25.58	4.6803799
Mount Tiffany	246 00 50.42	66 25 51.38	4.6514757
Lookout	313 59 10.98	134 12 40.49	4.4913150
Star	351 08 44.43	171 11 25.40	4.4603010

YAKIMA, YAKIMA COUNTY.

On the Columbia School building at North Yakima. The school is on the west side of the railroad and about one-fourth mile from the station.

Station mark: Center of tower.

[Latitude, 46° 36′ 02.66″. Longitude, 120° 30′ 47.80″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Atanum	31 57 25.79	211 54 03.56	4.0499121
Cowiche	86 37 25.94	266 20 33.22	4.4732021

WENAS, YAKIMA COUNTY.

On the high, east end of Umptanum Ridge, overlooking the Yakima River, about 12 miles south of Ellensburg.

Station mark: A copper bolt marked "U.S.G.S." set in drill hole in a small bowlder set in the ground and over which is a rock cairn 6 feet high.

[Latitude, 46° 50′ 19.34″. Longitude, 120° 31′ 33.65″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Atanum	7 51 02.49	187 48 13.22	4.5600570
Cowiche	45 29 49.62	225 13 28.29	4.6047034
Burge	74 26 52.79	254 15 19.85	4.3206371
Umptanum	105 40 53.38	285 34 57.91	4.0301322
Manastash	139 11 08.66	319 05 07.71	4.2040216
Normal School	176 33 39.13	356 33 02.19	4.2506572

LONE PINE, KLICKITAT COUNTY.

On the southern boundary line of the Yakima Indian Reservation on the highest point of the dividing ridge between the head of the Satas River and the Goldendale Valley, east of the pass through which runs the so-called lower road from Toppenish to Goldendale and The Dalles. It is a round, bare peak, steep on north side, moderately so on south, and about 3,000 feet above the Satas.

Station mark: A copper bolt marked "U.S.G.S." set in a drill hole in a small bowlder which is set in the ground at the base of a small living pine tree, and covered with a rock cairn piled over the mark and around the tree.

[Latitude, 45° 59′ 19.62″. Longitude, 120° 33′ 26.41″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Hood	52 40 03.00	231 51 16.00	5.04903
Granite	103 38 36.48	283 27 19.93	4.3182710
Mount Adams	108 31 03.00	287 50 48.00	4.87964
Signal Peak	120 44 33.12	300 19 34.44	4.7147861
Satas	153 17 47.58	333 09 24.26	4.5222012
Atanum	177 29 53.40	357 28 26.78	4.7675891
Hembree	210 31 09.65	30 42 31.51	4.6004702

PYRAMID, OKANOGAN COUNTY.

A high, bare, round-topped mountain on west side of Lake Chelan, at head of North Fork of Antiat River.

Station mark: A rock cairn 7 feet high and 3 feet diameter.

[Latitude, 48° 04′ 40.91″. Longitude, 120° 33′ 56.16″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Grade Creek	286 59 43.63	107 13 14.04	4.3731759
Camp Point	292 15 21.41	112 28 31.24	4.3764535
Stuart	20 35 03.55	200 20 11.74	4.8556865
Dirtyface	39 46 18.30	219 34 50.24	4.4784242
Index	63 05 08.63	242 26 29.45	4.8629885
Columbia	77 47 14.30	257 11 51.33	4.7826115
Chelan	307 03 32.08	127 27 18.57	4.6998075
Stormy	321 21 48.25	141 31 25.28	4.4122297
Boston	142 49 31.28	322 28 26.73	4.7601682
Gardner	187 04 25.58	7 08 00.14	4.6803799
Star	208 35 31.38	28 41 45.94	4.3358859
North Navarre	252 08 36.94	72 19 24.70	4.2765735

ATANUM, YAKIMA COUNTY.

On the highest point of Atanum Ridge, a low, flat, bare ridge extending east and west between the Atanum and Toppenish valleys. The station is about 8 miles southwest of North Yakima.

Station mark: A copper bolt marked "U.S.G.S." set in a drill hole in solid rock and having erected over it a rock cairn 7 feet high.

[Latitude, 46° 30′ 54.33″. Longitude, 120° 35′ 26.31″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Satas	23 17 27.66	203 10 28.93	4.4959478
Signal Peak	52 41 02.97	232 17 24.47	4.7226954
Cowiche	108 03 32.20	287 50 02.40	4.3975856
Burge	153 21 46.74	333 13 04.85	4.5308826
Umptanum	172 06 07.81	352 03 02.59	4.5936962
Wenas	187 48 13.22	7 51 02.49	4.5600570
Yakima	211 54 03.56	31 57 25.79	4.0499121
Hembree	316 39 09.72	136 52 01.43	4.5214435
Lone Pine	357 28 26.78	177 29 53.40	4.7675891

SAUK, SKAGIT COUNTY.

On a mountain forming the western rim of an extinct volcano. It has eight or nine small tops of nearly equal height. The first occupied is the highest and the third from the north end. The mountain lies just north of the junction of the Skagit and Sauk rivers. A. von Pressentin's store is at the south side of the mountain.

Station mark: A copper bolt set in drill hole in solid rock and surmounted by a rock cairn 4 feet high.

[Latitude, 48° 31′ 17.12″. Longitude, 121° 35′ 54.02″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Pilchuck	15 51 36.67	195 42 47.35	4.7301827
Boston	274 39 41.80	95 04 57.67	4.6200582
Whitechuck	338 39 31.07	158 47 15.73	4.5744328
Columbia	344 00 35.22	164 11 18.19	4.8123484

UMPTANUM, YAKIMA COUNTY.

On the highest point and near the western end of Umptanum Ridge, which extends east and west between Umptanum Creek on the north and Wenas Creek on the south, about 12 miles southwest from Ellensburg.

Station mark: A copper bolt marked "U.S.G.S." set in a drill hole in a small bowlder, which is set even with the surface of the ground and covered with a small rock mound.

[Latitude, 46° 51′ 52.87″. Longitude, 120° 39′ 40.86″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Burge	49 03 05.02	228 57 27.27	4.1141436
Manastash	179 03 21.38	359 03 16.14	3.9642829
Normal School	211 46 12.30	31 51 31.29	4.2435793
Wenas	285 34 57 91	105 40 53.38	4.0301322
Atanum	352 03 02.59	172 06 07.81	4.5936962

SATAS, YAKIMA COUNTY.

On the highest point of Toppenish Ridge, which extends east and west, south of Toppenish Valley. It lies about 10 miles southeast of Fort Simcoe.

Station mark: A copper bolt marked "U.S.G.S." set in a drill hole in solid rock, and having built over it a rock cairn 7 feet high.

[Latitude, 46° 15′ 21.98″. Longitude, 120° 45′ 04.66″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Granite	11 50 23.05	191 47 28.48	4.4044148
Hood	37 02 39.00	216 22 06.00	5.08831
Signal Peak	83 38 44.45	263 22 06.74	4.4740222
Klickitat	106 26 34.00	285 58 20.00	4.71766
Goat Rocks	117 15 14.45	296 46 48.68	4.75235
Cowiche	162 36 07.90	342 29 38.82	4.5825862
Burge	177 08 17.76	357 06 36.66	4.7722751
Atanum	203 10 28.93	23 17 27.66	4.4959478
Hembree	262 24 42.62	82 44 30.63	4.5501547
Lone Pine	333 09 24.26	153 17 47.58	4.5222012

BURGE, YAKIMA COUNTY.

On the high ridge lying between Wenas Creek on the north and the Naches River on the south. The station is on the east end of a rise in the ridge, at the head of the largest gulch running into the Wenas from the ridge, and lies just south of Milton Burge's ranch, from whence a lateral ridge leads directly up to it.

Station mark: A copper bolt marked "U.S.G.S." set in a drill hole in solid rock, and covered with a small pile of stones.

[Latitude, 46° 47′ 16.58″. Longitude, 120° 47′ 23.99″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cowiche	20 31 13.66	200 26 24.23	4.3831086
Umptanum	228 57 27.27	49 03 05.02	4.1141436
Wenas	254 15 19.85	74 26 52.77	4.3206371
Hembree	324 57 15.15	145 18 49.56	4.8225851
Atanum	333 13 04.85	153 21 46.74	4.5308826
Satas	357 06 36.66	177 08 17.76	4.7722751

GRANITE, YAKIMA COUNTY.

On the top of a granite butte standing about 75 feet above the level of the country immediately around it—a granite island in a sea of lava. It is located on the divide between the heads of the Satas River and Logy Creek. It lies about 2 miles east of the main divide between the Satas Basin and the Klickitat Valley. The old military road from The Dalles to Fort Simcoe, which is still passable for light vehicles, runs along the west slope of the main divide above spoken of, about 5 miles west of the station. From it saddle horses can be ridden to the foot of the butte.

Station mark: An aluminum bolt set in a drill hole on highest point and stamped "U.S.G.S."

[Latitude, 46° 01′ 57.54″. Longitude, 120° 49′ 06.76″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Signal Peak	131 23 27.32	311 09 46.02	4.5124785
Cowiche	174 09 06.65	354 05 33.32	4.7899153
Satas	191 47 28.48	11 50 23.05	4.4044148
Hembree	233 47 13.49	54 09 53.91	4.6992212
Lone Pine	283 27 19.93	103 38 36.48	4.3182710

DIRTYFACE, OKANOGAN COUNTY.

On a five-pointed mountain at the northeast end of Wenache Lake, around the foot of which a wagon road from Leavenworth winds. From road to the summit is a foot climb of 5,000 feet, very steep and rocky. The point occupied is the most northerly and highest peak on the mountain.

Station mark: Copper bolt in granite, above which a rock cairn 7 feet high was erected.

[Latitude, 47° 52′ 11.08″. Longitude, 120° 49′ 22.41″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Stuart	7 31 52.07	187 28 26.51	4.6476157
Index	77 37 11.21	257 10 02.28	4.6707051
Columbia	105 15 14.25	283 51 22.16	4.6159886
Pyramid	219 34 50.24	39 46 18.30	4.4784242

COWICHE, YAKIMA COUNTY.

On the highest point of a round flat-topped mountain lying between Cowiche Creek and the North Fork of Atanum Creek. It is about 4 miles northwest of Tampico post-office. The mountain is bare except for pine timber on northeast slope.

Station mark: A copper bolt marked "U.S.G.S.," set in a drill hole in solid rock and having built over it a rock cairn 6 feet high.

[Latitude, 46° 35′ 03.60″. Longitude, 120° 54′ 01.79.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Burge	200 26 24.23	20 31 13.66	4.3831086
Wenas	225 13 28.29	45 29 49.62	4.6047034
Yakima	266 20 33.22	86 37 25.94	4.4732021
Atanum	287 50 02.40	108 03 32.20	4.3975856
Hembree	304 11 53.65	124 38 14.15	4.7515642
Satas	342 29 38.82	162 36 07.90	4.5825862

BOSTON, ON BOUNDARY BETWEEN SKAGIT AND OKANOGAN COUNTIES.

A sharp rocky point about 4 miles north of Cascade Pass. A red sugar-loaf peak, a little higher, but inaccessible, lies about one-half mile to north on the same ridge. The Boston mine is at the foot of the peak on the southeast. Four glaciers on the four sides of the peak reach nearly to the summit.

Station mark: A copper bolt set in drill hole in solid rock.

[Latitude, 48° 29′ 22.48″. Longitude, 121° 02′ 10.23″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Sauk	95 04 57.67	274 39 41.80	4.6200582
Star	300 22 31.69	120 49 53.68	4.7204074
North Navarre	306 51 21.30	127 23 16.21	4.8212967
Pyramid	322 28 26.73	142 49 31.28	4.7601682
Skookum	335 31 51.69	155 39 34.98	4.4897000

SIGNAL PEAK, YAKIMA COUNTY.

Located in T. 9 N., R. 14 E. The corner stake of secs. 29, 30, 31, and 32 lies nearly on its summit. The station is directly across the Klickitat River and 17 miles from Mount Adams. It is on the most prominent point on the divide between Toppenish Creek and the Klickitat River, and is an isolated point, but quite flat on top, having on it a few scattering trees. The corner stake of secs. 29, 30, 31, and 32, T. 9 N., R. 14 E., is near the station.

Station mark: A copper bolt marked "U.S.G.S.," set in a drill hole in solid rock, and having built over it a rock cairn 8 feet high.

[Latitude, 46° 13′ 32.89″. Longitude, 121° 08′ 06.05″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Mount Hood	24 47 54.00	204 23 52.00	5.01852
Mount Adams	84 29 29.00	264 14 10.00	4.43801
Klickitat	131 10 32.00	310 58 57.00	4.43615
Goat Rocks	144 26 16.00	324 14 31.00	4.55331
Atanum	232 17 24.47	52 41 02.97	4.7226954
Satas	263 22 06.74	83 38 44.45	4.4740222
Lone Pine	300 19 34.44	120 44 33.12	4.7147861
Granite	311 09 46.02	131 23 27.32	4.5124785

Secondary Triangulation Stations.

The following secondary stations, located along or near the shores of Lake Chelan by Mr. W. T. Griswold, topographer, and C. R. Smith, assistant, in 1897, are based upon the adjusted positions of Stormy, Cooper, Chelan, Navarre, and Pyramid stations of the primary triangulation from the Ellensburg base.

INDIAN POINT, OKANOGAN COUNTY.

On the highest point of a cape extending south from the Wapato Indian Reservation into Lake Chelan.

[Latitude, 47° 52′ 23″. Longitude, 120° 09′ 28.5″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Cooper	200 26 31.00	20 29 53.00	4.20884
Chelan	308 34 47.00	128 40 13.00	4.08185

GRADE CREEK, OKANOGAN COUNTY.

On a rocky bench about 900 feet above and 1,000 feet west of mouth of Grade Creek, which is opposite Twentyfivemile Creek on Lake Chelan.

[Latitude, 48° 00′ 56.0″. Longitude, 120° 15′ 46.4″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Camp Point	15 09 16	195 08 56	3.33903
Stormy	26 08 15	206 04 22	4.16918
Deer Point	106 56 56	286 54 38	3.60510
Pyramid	107 13 14	286 59 44	4.37318

CAMP POINT, OKANOGAN COUNTY.

On the first point above Twentyfivemile Creek on west shore of Lake Chelan, 150 feet above the lake and 50 feet from the shore.

[Latitude, 47° 59′ 47.8″. Longitude, 120° 16′ 14.0″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Pyramid	112 28 31	292 15 21	4.37645
Ryans Point	115 14 21	295 10 32	3.84908
Deer Point	134 59 01	314 57 03	3.66663
Grade Creek	195 08 56	15 09 16	3.33903

DEER POINT, OKANOGAN COUNTY.

On east side of Lake Chelan on point 2¼ miles below Safety Harbor and 3½ miles above mouth of Twentyfivemile Creek, 100 feet above lake and 300 feet from shore.

Station mark: Copper bolt in large bowlder.

[Latitude, 48° 01′ 34.0″. Longitude, 120° 18′ 52.4″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Ryans Point	85 01 33	265 59 42	3.49399
Safety Harbor	111 08 26	291 04 47	3.81654
Grade Creek	286 54 38	106 56 56	3.60510
Camp Point	314 57 03	134 59 01	3.66663

RYANS POINT, OKANOGAN COUNTY.

On west side of Lake Chelan on point one-half mile below and opposite Safety Harbor, 20 feet above lake and 10 feet from shore.

Station mark: Copper bolt in solid rock.

[Latitude, 48° 01′ 25.2″. Longitude, 120° 21′ 22.4″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Eureka	114 01 39	294 00 32	3.30675
Safety Harbor	131 11 48	311 10 00	3.60176
Deer Point	264 59 42	85 01 33	3.49399
Camp Point	295 10 32	115 14 21	3.84908

EUREKA, OKANOGAN COUNTY.

On the west shore of Lake Chelan on small bluff opposite Safety Harbor, 20 feet above lake and 50 feet from shore.

Station mark: Copper bolt in solid rock.

[Latitude, 48° 01′ 51.9″. Longitude, 120° 22′ 51.7″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
G	112 28 32	292 25 29	3.74212
J	129 32 44	309 30 49	3.61783
Safety Harbor	147 21 49	327 21 08	3.33164
Ryans Point	294 00 32	114 01 39	3.30675

SAFETY HARBOR, OKANOGAN COUNTY.

On east side of Lake Chelan on first point above Safety Harbor. 200 feet above lake and 100 feet from shore.

Station mark: Copper bolt in solid rock, partly covered with sand.

[Latitude, 48° 02′ 50.4″. Longitude, 120° 23′ 47.6″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
G	94 23 36	274 21 14	3.59739
Deer Point	291 04 47	111 08 26	3.81654
Ryans Point	311 10 00	131 11 48	3.60176
Eureka	327 21 08	147 21 49	3.33164

J, OKANOGAN COUNTY.

On a high point on east shore of Lake Chelan, opposite mouth of Big Creek, 250 feet above lake and 175 feet from shore.

Station mark: An eyebolt 8 inches long set in solid rock.

[Latitude, 48° 03′ 17.4″. Longitude, 120° 25′ 26.2″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
G	74 25 19	254 24 11	3.29594
H	126 25 17	306 24 18	3.30930
Eureka	309 30 49	129 32 44	3.61783

H, OKANOGAN COUNTY.

Situated on rocky bluff 120 feet from water on east side of Lake Chelan, opposite a point 2 miles below Graham Harbor.

Station mark: Copper bolt in solid rock.

[Latitude, 48° 03′ 56.6″. Longitude, 120° 26′ 45.4″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	Meters.
G	8 35 56	188 35 47	3.24576
E	133 44 25	313 43 58	3.03252
J	306 24 18	126 25 17	3.30930

G, OKANOGAN COUNTY.

On west side of Lake Chelan, one-fourth mile above mouth of stream entering from southwest, on rocky bluff 50 feet above lake and 20 feet from shore.

Station mark: Hole drilled in bowlder.

[Latitude, 48° 03′ 00.2″. Longitude, 120° 26′ 58.1″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	Meters.
Graham Harbor	140 26 53	320 25 14	3.63526
E	168 17 14	348 16 56	3.40470
H	188 35 47	8 35 56	3.24576
J	254 24 11	74 25 19	3.29594
Safety Harbor	274 21 14	94 23 36	3.59739
Eureka	292 25 29	112 28 32	3.74212

E, OKANOGAN COUNTY.

Near the water, on the east shore of Lake Chelan, opposite mouth of small stream which comes into the lake 1 mile below Graham Harbor.

Station mark: Copper bolt in solid rock.

[Latitude, 48° 04′ 20.7″. Longitude, 120° 27′ 23.0″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	Meters.
Graham Harbor	110 39 38	290 38 37	3.37798
Rock Point	146 50 39	326 49 21	3.59720
H	313 43 58	133 44 25	3.03252
G	348 16 56	168 17 14	3.40470

ROCK POINT, OKANOGAN COUNTY.

On the east shore of Lake Chelan, 1 mile above and across the lake from Graham Harbor, being a rock bluff which juts out into the lake and has a flat top about 100 feet above water.

Station mark: Copper bolt.

[Latitude, 48° 06′ 07.9″. Longitude, 120° 29′ 07.6″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Graham Harbor	1 37 08	181 37 05	3.39267
Wood yard	106 14 51	286 13 46	3.27264
Upper wood yard	140 43 41	320 42 24	3.52476
E	326 49 21	146 50 39	3.59720

GRAHAM HARBOR, OKANOGAN COUNTY.

On west side of Lake Chelan, on the highest point of large smooth rock which forms the cape just above Graham Harbor.

Station mark: Copper bolt in solid rock.

[Latitude, 48° 04′ 47.9″. Longitude, 120° 29′ 10.9″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Wood yard	149 59 14	329 58 12	3.53863
Rock Point	181 37 05	1 37 08	3.39267
E	290 38 37	110 39 58	3.37798
G	320 25 14	140 26 53	3.63526

PRINCE CREEK BLUFF, OKANOGAN COUNTY.

On a bench 600 feet higher than the lake, and about 1,000 feet from it, on the north side of Prince Creek.

Station mark: Old snag marked by tacks.

[Latitude, 48° 08′ 59.5″. Longitude, 120° 29′ 25.7″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Canoe Creek	00 50 06	180 50 05	3.40003
Upper wood yard	32 46 30	212 45 27	3.50809
Pyramid	35 01 06	214 57 45	3.98919

CANOE CREEK, OKANOGAN COUNTY.

On the east side of Lake Chelan, just below the mouth of Canoe Creek, about 20 feet from shore of lake.

Station mark: Copper bolt in large granite bowlder.

[Latitude, 48° 07′ 38.2″. Longitude, 120° 29′ 27.5″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Wood yard	31 28 55	211 28 05	3.42414
Pyramid	45 26 12	225 22 52	3.89235
Upper wood yard	83 25 01	263 23 59	3.23522
High Twin Harbor	130 12 34	310 11 13	3.46785
Prince Creek	168 33 16	348 33 02	3.29943
Prince Creek Bluff	180 50 05	0 50 06	3.40003

WOOD YARD, OKANOGAN COUNTY.

On the west shore of Lake Chelan, a short distance below wood landing and 1½ miles below Twin Harbor.

Station mark: Copper bolt.

[Latitude, 48° 06′ 24.8″. Longitude, 120° 30′ 34.5″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Upper wood yard	171 10 08	351 09 56	3.32062
Canoe Creek	211 28 05	31 28 55	3.42414
Rock Point	286 13 46	106 14 51	3.27264
Graham Harbor	329 58 12	149 59 14	3.53863

UPPER WOOD YARD, OKANOGAN COUNTY.

On the west shore of Lake Chelan, one-half mile below Twin Harbors, very close to shore of lake and about 3 feet above the water mark.

Station mark: Copper bolt in solid rock.

[Latitude, 48° 07′ 31.8″. Longitude, 120° 30′ 50″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Prince Creek	211 22 34	31 23 22	3.40119
Prince Bluff Creek	212 45 27	32 46 30	3.50809
Canoe Creek	263 23 59	83 25 01	3.23522
Rock Point	320 42 24	140 43 41	3.52476
Wood yard	351 09 56	171 10 08	3.32062

HIGH TWIN HARBORS, OKANOGAN COUNTY.

On the west side of Lake Chelan, on the top of the first bench opposite the mouth of Prince Creek.

Station mark: Copper bolt in solid rock.

[Latitude, 48° 08′ 39.5″. Longitude, 120° 31′ 16″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Prince Creek	268 12 17	88 13 24	3.26673
Canoe Creek	310 11 13	130 12 34	3.46785

CALIFORNIA.

Triangulation Stations.

Stations located by the three-point method for the control of the Redding quadrangle, by Mr. C. F. Urquhart, from Lassen, Linn, and Shasta primary stations.

CONE, SHASTA COUNTY (not occupied).

The highest point of a small, round, timber-covered mountain, about 16 miles east from Anderson, a station on the Southern Pacific Railroad.

[Latitude, 40° 27′ 18.30″. Longitude, 122° 00′ 00.95″.]

HIRZ, SHASTA COUNTY.

On the west side of McCloud River, about 10 miles above Baird post-office (United States Fishery) and on the highest point of a ridge a little west of north, and distant from Henry Hirz's residence about 3½ miles. There is a trail from Baird to Mr. Hirz's residence, thence north up mountain to station.

Station mark: A rock monument 7 feet high.

[Latitude, 40° 53′ 45.10″. Longitude, 122° 15′ 30.38″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Lassen	305 16 11.99	125 45 39.81	4.8932981
Linn	28 04 02.93	207 40 50.06	5.0340188
High	177 47 44.85	357 47 33.77	4.0118810
Shasta	185 18 36.80	5 21 09.26	4.7565211

HIGH, SHASTA COUNTY (not occupied).

The most eastern of three small peaks, resembling notches, on the first high mountain north from Hirz station. The highest point on mountain is to the west of this point and flat on top.

No station mark.

[Latitude, 40° 59′ 18.07″. Longitude, 122° 15′ 47.22″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Redding court-house	14 02 34.26	193 57 44.43	4.6687247

BASS, SHASTA COUNTY.

On the highest point of mountain, about 4 miles northwest from Stillwater post-office. A trail from James Bass's residence (one-half mile north from Stillwater) goes up a small creek to foot of mountain.

Station mark: A small lone oak signal tree, with "U. S." cut in it.

[Latitude, 40° 43′ 52.80″. Longitude, 122° 22′ 03.16″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Lassen	290 08 18.24	110 41 58.75	4.8913676
Linn	28 17 50.05	207 58 54.02	4.9429792
Hirz	206 42 30.90	26 46 37.05	4.3109618
Cone	314 29 41.84	134 44 02.22	4.6402708
High	197 06 44.47	17 10 50.46	4.4752502
Shasta....................	190 51 21.32	10 58 11.26	4.8836244

REDDING COURT-HOUSE, SHASTA COUNTY.

Station mark: Top of cupola on court-house.

[Latitude, 40° 34′ 51.49″. Longitude, 122° 23′ 48.50″.]

To station—	Azimuth.	Back azimuth.	Log. distance.
	° ′ ″	° ′ ″	*Meters.*
Lassen	277 36 07.38	98 10 53.25	4.8822961
Linn	32 50 31.99	212 32 45.87	4.8576244
Bass.....................	188 24 45.38	368 25 47.94	4.2274338
Hirz	198 26 10.94	18 31 11.56	4.5667784
Cone	292 27 21.58	112 42 49.00	4.5610472
Shasta....................	190 24 00.46	10 31 59.36	4.9701551

SPIRIT LEVELING.

During the field season careful spirit leveling was continued in connection with the regular topographic work on the same general plan followed the two preceding seasons, as described in the Eighteenth Annual Report, Part I, 1897, pages 225–235.

The practice of stamping an initial datum letter or name on the bench marks has been continued, and in cases where the datum has been changed on account of better determination of the reference to sea level, such changes are noted in the list of elevations which follows.

The following table shows the distribution of leveling parties, localities of work, length of closure circuits in miles, with their closure errors in feet, and names of levelmen:

Localities of work, lengths of closed circuits, closure errors, and levelmen.

State.	Datum.	Length of circuit.	Closure error.	Levelmen.
ATLANTIC SECTION.		*Miles.*	*Feet.*	
New York	Dunkirk	68	0.148	W. F. Hammond.
Do	do	40	0.175	Do.
Do	do	34	0.043	Do.
Do	Oswego	61	0.143	C. H. Semper.
Do	do	37	0.110	Do.
Do	do	55	0.264	Do.
Do	do	26	0.090	Do.
Do	do	49	0.310	Do.
Do	do	105	0.287	Do.
Do	do	15	0.021	W. E. Green.
Do	do	45	0.300	Do.
Do	Albany	60	0.469	W. W. Gilbert and A. W. Gill.
Do	do	45	0.358	W. W. Gilbert.
Do	do	151	0.103	Do.
Do	do	15	0.201	J. E. Thomas.
Do	do	60	0.217	Do.
Do	do	36	0.095	A. W. Gill.
Do	do	57	0.313	Seth Van Loan.
Do	do	37	0.110	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Continued.

State.	Datum.	Length of circuit.	Closure error.	Levelmen.
ATLANTIC SECTION—continued.		*Miles.*	*Feet.*	
New York	Albany	47	0.222	W. W. Gilbert and A. W. Gill.
Do	do	34	0.167	Do.
Do	do	11	0.060	Do.
Do	do	9	0.089	Do.
Do	do	13	0.032	W. W. Gilbert.
Do	do	30	0.678	J. E. Thomas.
Do	do	8	0.071	Do.
Do	do	28	0.217	Do.
Do	do	22	0.277	A. W. Gill.
Do	do	40	0.129	W. W. Gilbert.
Do	do	77	0.436	E. L. McNair.
Do	do	40	0.07	W. W. Gilbert.
Do	do	63	0.132	S. M. Van Loan.
Do	do	174	0.062	C. B. Bailey.
Do	do	45	0.054	A. W. Gill.
Do	do	40	0.183	Do.
Maryland	Baltimore	20	0.185	C. M. Smith.
Do	do	37	0.266	Do.
Do	do	14	0.288	Do.
New York-Pennsylvania.	Pittsburg	1,227	0.215	C. H. Semper and Pennsylvania R. R.
Maryland-Pennsylvania-New York.	do	1,606	0.368	C. H. Semper, E. L. McNair, and United States Coast and Geodetic Survey.
Maryland-Pennsylvania.	do	686	0.023	E. L. McNair, United States Coast and Geodetic Survey, and Pennsylvania R. R.
New Jersey-Pennsylvania.	Harrisburg	376	0.079	United States Coast and Geodetic Survey and Pennsylvania R. R.
Pennsylvania-New York.	do	91	0.023	C. H. Semper and R. Coe.
Pennsylvania	do	49	0.138	Do.
Do	do	46	0.086	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Continued.

State.	Datum.	Length of circuit.	Closure error.	Levelmen.
ATLANTIC SECTION—continued.		*Miles.*	*Feet.*	
Pennsylvania	Erie	41	0.093	Wm. Crennell, jr., and J. H. Wetzel.
Do	Pittsburg	37	0.056	Do.
Do	do	32	0.025	Do.
Do	do	10	0.001	Do.
Do	do	28	0.016	Do.
Do	do	29	0.307	Do.
Ohio	Columbus	120	0.492	W. F. Hammond.
Do	do	30	0.054	Do.
Do	do	23	0.014	Do.
Do	do	14	0.038	Do.
West Virginia	Kanawha	112	0.263	H. Wood.
Do	do	36	0.129	Do.
Do	do	35	0.165	Do.
Tennessee-Alabama.	Nashville	461	0.130	W. W. Gilbert.
Tennessee	do	52	0.380	H. Wood.
Do	do	61	0.104	Do.
Do	do	25	0.435	Do.
Do	do	26	0.438	Do.
Alabama-Georgia	Anniston	102	0.487	W. S. D. Moore.
Do	do	63	0.269	Do.
CENTRAL SECTION.				
Nebraska	Sidney	104	0.073	E. E. Sands.
Do	do	40	0.065	Do.
Do	do	20	0.064	Do.
Do	do	50	0.121	Do.
Do	do	60	0.132	Do.
Do	do	4	0.027	Do.
Do	do	3	0.013	Do.
Iowa	Dubuque	44	0.128	Tim Burns.
Do	do	51	0.165	Do.
Do	do	18	0.068	Do.
Do	do	41	0.065	Do.
Minnesota		11	0.073	L. B. Weed.
Do		2	0.025	Do.
Missouri	St. Louis	32	0.099	J. L. Holman.
Do	do	45	0.009	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Continued.

State.	Datum.	Length of circuit.	Closure error.	Levelmen.
CENTRAL SECTION—continued.		*Miles.*	*Feet.*	
Missouri	St. Louis	41	0.130	J. L. Holman.
Do	do	70	0.150	Do.
Do	do	30	0,150	Do.
Arkansas	Fayetteville	37	0.163	Clifford Older.
Do	do	71	0.522	Do.
Do	do	14	0.230	Do.
Do	Hot Springs	58	0.001	D. C. Wray.
Do	do	74	0.406	Do.
Do	do	66	0.028	Do.
Do	do	113	0.032	Do.
Wisconsin	Baraboo	60	0.193	Do.
Do	do	15	0.081	Do.
Do	do	21	0.197	Do.
Do	St. Paul	26	0.207	Do.
Do	do	40	0.108	Do.
Do	do	25	0.243	Do.
Do	do	10	0.065	Do.
Do	do	38	0.064	Do.
Do	Portage	40	0.015	L. E. Granke.
Do	do	42	0.013	Do.
Do	do	36	0.033	Do.
Do	do	7	0.032	Do.
Do	do	10	0.021	Do.
Do	do	3	0.014	Do.
Do	Wausau	60	0.155	R. Wipfler.
Do	do	47	0.337	Do.
Do	do	63	1.327	Do.
Do	do	39	0.313	Do.
Do	do	45	0.299	Do.
Indiana	Evansville	38	0.116	L. E. Granke.
Do	do	6	0.014	Do.
Do	do	44	0.080	Do.
Ohio	Toledo	29	0.501	Dean Halford.
Do	do	21	0.269	Do.
Do	do	22	0.557	Do.
Do	do	13	0.010	Do.
Do	do	37	0.341	Do.
Do	do	17	0.006	Do.
Do	do	29	0.366	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Continued.

State.	Datum.	Length of circuit.	Closure error.	Levelmen.
ROCKY MOUNTAIN SECTION.		*Miles.*	*Feet.*	
South Dakota	Deadwood	13	0.057	John T. Stewart.
Do	do	16	0.114	Do.
Do	do	8	0.252	Do.
Do	do	6	0.021	Do.
Do	do	21	0.367	Do.
Do	do	24	0.316	Do.
Do	do	44	0.060	Do.
Do	do	35	0.280	Do.
Do	do	5	0.007	Do.
Do	do	32	0.061	Do.
Wyoming	do	74	0.000	Do.
Do	do	12	0.122	Do.
Do	do	18	0.092	Do.
Do	do	36	0.069	Do.
Do	do	13	0.020	Do.
Do	Sheridan	47	1.500	C. E. Worthington.
Do	do	18	0.492	Do.
Do	do	102	0.094	C. E. Worthington and E. W. Glafcke.
Do	do	42	0.221	Do.
Do	do	40	0.717	E. W. Glafcke.
Do	do	36	0.147	Do.
Do	do	17	0.058	Do.
Do	do	110	0.007	Do.
Do	do	77	0.046	Do.
Do	do	10	0.070	Do.
Do	Burlington and Missouri River Railroad.	31	0.115	Goyne Drummond.
Do	do	31	0.011	Do.
Do	do	27	0.111	Do.
Do	do	62	0.429	Do.
Do	do	19	0.233	Do.
Do	do	34	0.008	Do.
Do	do	63	0.769	Beach and Drummond.
Utah	Salt Lake	51	0.123	L. C. Woodbury.
Do	do	54	0.041	Do.
Do	do	19	0.058	Do.

Localities of work, lengths of closed circuits, closure errors, and levelmen—Continued.

State.	Datum.	Length of circuit.	Closure error.	Levelmen.
ROCKY MOUNTAIN SECTION—cont'd.		*Miles.*	*Feet.*	
Texas	San Antonio	17	0. 722	Thomas Winsor.
Do	do	45	0. 331	Do.
Do	do	46	0. 355	Do.
Do	do	19	0. 365	Do.
Do	do	6	0. 021	Do.
Do	do	18	0. 857	Do.
Do	do	37	0. 164	Do.
Do	Fort Smith	81	0. 469	E. W. Glafcke.
Do	do	65	0. 473	Do.
PACIFIC SECTION.				
Washington	Tacoma	49	0. 303	H. K. Kalloch.
Do	do	10	0. 005	Do.
Do	do	47	0. 295	Do.
Do	do	45	0. 325	Do.
Do	do	7	0. 111	Do.
Do	do	23	0. 031	Do.
Do	do	25	0. 093	E. M. Fry.
Do	do	24	0. 06	Do.
Do	do	198	0. 713	Do.
Oregon	Baker City	62	0. 068	W. R. Manning.
Do	do	40	0. 489	Do.
Do	do	15	0. 160	Do.
California	Benicia	102	0. 373	L. D. Ryus.
Do	do	130	0. 416	Do.
Do	do	50	0. 176	Do.
Do	Redwood	32	0. 264	C. R. Smith.
Do	San Bernardino	85	0. 375	C. C. Ward.
Do	do	44	0. 011	C. R. Smith.
Do	do	12	0. 178	Do.
Do	do	46	0. 299	R. A. Hamilton.
Do	do	148	0. 128	C. C. Ward.
Idaho	Spokane	9	0. 118	M. P. Page.
Do	do	6	0. 022	Do.
Do	do	6	0. 02	Do.
Do	do	29	0. 128	Do.
Do	do	12	0. 141	Do.
Do	do	8	0. 132	Do.

In the following list only those elevations are published which have been adjusted and checked in closed circuits. Much work has been done in addition to the list here published, especially in mountainous regions, which it is thought inadvisable to publish at this time on account of the many lines which were left unchecked at the end of the field season, and also on account of errors of closure in a few circuits in excess of the limiting error allowed by the formula $0.05\sqrt{\text{distance in miles}}$. These lines in most cases will be rerun to bring them within the required limit.

ATLANTIC SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. H. M. Wilson, geographer in charge, spirit leveling was continued for the control of the regular topographic work executed during the year in various localities as listed below. In addition leveling was carried on in the following localities during the year 1899; but as the field work in these localities is not yet completed, the results will not be published until later:

Maine—Waldo, Hancock, and Penobscot counties.

New York—Hamilton and Otsego counties.

New York and Pennsylvania—Between Elmira, Williamsport, and Harrisburg.

Pennsylvania—York, Fayette, Washington, and Westmoreland counties.

Delaware—Sussex and Kent counties.

Maryland—Baltimore, Harford, Talbot, Queen Anne, Caroline, and Kent counties.

West Virginia—Monongalia and Preston counties.

North Carolina—Madison, McDowell, Yancey, and Burke counties.

Tennessee and Alabama—From Cleveland, via Chattanooga and Columbia, to Nashville.

NEW YORK.

ALBANY, SARATOGA, AND WARREN COUNTIES.

SCHENECTADY, SARATOGA, LUZERNE, AND NORTH CREEK QUADRANGLES.

The elevations published in the following list are derived from the line of precise levels run from United States Engineers' bench mark in Schenectady. (See Appendix to Twentieth Annual Report, page 309.) The datum on which this work is based is the Gristmill bench mark at Albany. The result of this work has been to obtain a definite elevation for a bench mark at North Creek, upon which the leveling published in the Appendix to the Eighteenth Annual Report and amended in the Appendix to the Twentieth Annual Report has heretofore been based.

The leveling was done by Mr. E. L. McNair, and all bench marks set in the course of this work are stamped with the letters "ALBANY 1899" in addition to the figures of elevation.

SCHENECTADY, VIA DELAWARE AND HUDSON RAILROAD, TO NORTH CREEK.

	Feet.
Schenectady, New York Central and Hudson River Railroad bridge over Erie Canal, northeast corner of; coping stone of abutment, marked "242 ALBANY 1899." Set in August, 1898	240.768
Ballston Lake, three-fourths of a mile north of; coping stone at west end of stone culvert under railroad; aluminum tablet, marked "269 ALBANY 1899"	268.689
Ballston, Saratoga County court-house, foundation stone 4 feet left of main entrance to; aluminum tablet, marked "320 ALBANY"	320.421
Saratoga, Laughbery Lake, surface of water	283
Saratoga, Delaware and Hudson Railroad station, 1,500 feet south of; coping stone at east end of north abutment of steel-girder bridge No. 37 over Congress street; aluminum tablet, marked "314 ALBANY 1899"	313.981
Greenfield station, one-third of a mile north of; coping stone at southeast corner of stone culvert under railroad; aluminum tablet, marked "596 ALBANY 1899"	595.916
Kings station, 0.8 mile north of; coping stone at northeast corner of stone culvert under railroad; aluminum tablet, marked "602 ALBANY 1899"	602.407
Hadley, 1½ miles south of; coping stone at northeast corner of stone culvert about 600 feet west of red house on west side of highway; aluminum tablet, marked "634 ALBANY 1899"	633.882
Hadley, 3¼ miles north of; coping stone of bridge seat at northeast corner of steel-girder bridge No. 9 over Wolf Creek; aluminum tablet, marked "630 ALBANY 1899"	630.031
Stony Creek, 0.4 mile south of; coping stone of bridge seat at northwest corner of steel-girder bridge No. 10 over Stony Creek; aluminum tablet, marked "600 ALBANY 1899"	600.00
Thurman, 1¼ miles north of; coping stone at west end of south abutment of steel-girder bridge No. 13; aluminum tablet, marked "628 ALBANY 1899"	627.837
The Glen, Delaware and Hudson Railroad station, 530 feet north of; coping stone of bridge seat at southwest corner of steel-girder bridge No. 14; 5 feet west of girder; aluminum tablet, marked "749 ALBANY 1899"	749.083
Riverside, 230 feet north of station door; 65 feet west of center of main track in large, flat, rock outcrop 25 feet west of road; aluminum tablet, marked "883 ALBANY 1899"	883.216
Riverside, chisel mark 2 feet northeast of tablet described above	883.156
North Creek station, 0.4 mile southeast of; bridge seat at southeast corner of steel-girder bridge No. 18, 4.4 feet below east rail; aluminum tablet, marked "1001 ALBANY 1899"	1,001.064
North Creek station, 1,000 feet north of; in quarry outcrop on southwest side of track, 2 feet above track and about 6 feet from southwest rail; bronze tablet, marked "1012." Note: This tablet set in 1896, the published elevation of same in Appendix to the Twentieth Annual Report of Director being 1,007.185	1,007.621
North Creek station, chisel mark on same rock as permanent bench mark described above and elevation published as 1,008.276	1,008.712

	Feet.
Northampton, about 2¼ miles south of; bench mark is on old bench mark (State) marked No. 72, on ledge of rock near crest of hill, re-marked "U.S.G.S. 1020"	1,019.34
Northampton, 2.9 miles south of; bench mark is on old bench mark (State) at intersection of roads, northwest corner, 50 feet north of road, painted "U.S.G.S. 1035"	1,034.50
Hagedorns Mills, 1 mile north of; bench mark is on black granite bowlder on south side of road, marked "U.S.G.S. 999"	998.25
Hagedorns Mills; bench mark is bronze tablet set in south abutment southeast corner over creek at, marked "975 ALBANY"	974.374
Hagedorns Mills, ¾ mile southeast of; chisel mark on bowlder at northeast corner of road intersection, marked "B. M. U.S.G.S. 1100"	1,098.97
Signal station, ½ mile west of; chisel mark on bowlder near summit of hill and south side of road, marked "U.S.G.S. 1128"	1,127.25
Galway, bench mark on square stone monument on what is locally known as Mechanic street stone; marked "17 N.Y.S.S.," 200 feet north of road	1,266.34
Mosherville, bench mark on stone wall used as bank of creek near road intersection at bridge, 100 feet east of foundry; marked "B.M. 37"	883.11
East Galway, bench mark is on bronze tablet in east side of foundation wall of Baptist church in village; marked "889 ALBANY"	889.206
Rock City Falls, 2.5 miles northwest of; near gristmill at Middle Grove; bench mark is on northwest corner of west abutment to iron bridge over Kayaderosseros Creek	523.09
Middle Grove, gristmill at; elevation of dam	525.85
Middle Grove, 2.30 miles from; chisel mark on large bowlder 200 feet east of white house on hill, known as Grennell's, and about 580 feet east of four corners, at side of road	600.17
Middle Grove, bench mark on bronze tablet set in east end of south abutment of iron bridge over Kayaderosseros Creek at; marked "523 ALBANY"	523.049

HADLEY TO NORTHAMPTON, VIA DAY CENTER AND BATCHELLERVILLE.

Hadley, bench mark on aluminum tablet in northwest corner of G. West's paper mill; marked "613 ALBANY"	613.49
Hadley, 1 mile from tablet in; chisel mark on bowlder on north side of road; marked "B.M. U.S.G.S. 593"	592.53
Hadley, 2¾ miles southwest of; chisel mark on bowlder 1,000 feet southwest of south end of iron bridge over Sacandaga River; marked "U.S. G.S. B.M. 621"	620.81
Hadley, 5¾ miles southwest of; old bench mark on bowlder east side of lower river road leading to Conklingville, about 1,500 feet north of road, intersection; chiseled "B.M. 11," painted "U.S.G.S. 628"	628.39
Conklingville, 1¼ miles northeast of; old bench mark on bowlder south side of road, chiseled "B.M. 14," painted "U.S.G.S. 654"	654.21
Conklingville, ½ mile south of; chisel mark on bowlder on east side of road, 6 miles southwest of Hadley, 1,300 feet northwest of white house, painted "B.M. U.S.G.S. 683"	682.90
Conklingville, bench on bronze tablet set west end of south abutment of iron bridge over the Sacandaga River, marked "726 ALBANY"	725.612
Conklingville, Effnars Lake, surface of water, crest of dam	1,170.00
Conklingville, 1 mile southwest of tablet at; chisel mark on bowlder on east side of road, painted "B.M. U.S.G.S. 784"	783.54

	Feet.
Conklingville, 3 miles southwest of; old chisel mark on large bowlder 30 feet south of road, chiseled "B.M. 28," painted "U.S.G.S. 747"	746.40
Conklingville, 4 miles southwest of; chisel mark on bowlder south side of road, painted "B.M. U.S.G.S. 768"	767.40
Conklingville, 5 miles southwest of; chisel mark on bowlder east side of road, painted "B.M. U.S.G.S. 756"	755.00
Day Center, bench mark top of small stone post at northeast corner of cemetery lot inclosed by stone and iron fence, monument marked "Flansburgh," painted on fence "B.M. U.S.G.S. 765"	764.85
Day Center, 1 mile southwest of; chisel mark on bowlder on south side of road, 1,000 feet northeast of house, marked "B.M. U.S.G.S. 737"	736.32
Day Center, 2 miles southwest of; chisel mark on bowlder in front of house, north side of road, marked "B.M. U.S.G.S. 739"	738.84
Day Center, 3 miles southwest of; on road leading to Hunt Lake; chisel mark on bowlder south side of road	737.40
Day Center, 4 miles east of; chisel mark on large bowlder 150 feet west of log house near summit of hill, north side of road leading to Effnars Lake, marked "B.M. U.S.G.S. 1166"	1,165.36
Day Center, 5 miles southeast of; on road leading to Effnars Lake; chisel mark on bowlder on south side of road opposite log house, marked "B.M. U.S.G.S. 1129"	1,128.32
Day Center, 6 miles from; on lake road; chisel mark on bowlder south side of road, 125 feet east of house	1,007.18
Day Center, 3 miles southeast of; on lake road; bronze tablet set in ledge of rock near house owned and occupied by John S. Kinney, marked "1009 ALBANY"	1,009.08
Day Center, 1 mile from; chisel mark on bowlder north side of road leading to Effnars Lake, marked "1036 B.M. U.S.G.S."	1,035.41
Huntsville, 700 feet south of schoolhouse; chisel mark on bowlder west side of road 1,900 feet southwest of; marked "B.M. U.S.G.S. 755"	754.50
Huntsville, 1½ miles southwest of; chisel mark on large bowlder directly across from yellow house, marked "B.M. U.S.G.S. 740"	739.90
Huntsville, 3½ miles southwest of; chisel mark on bowlder west side of road 800 feet north of house on knoll, marked "B.M. U.S.G.S. 759"	759.03
Huntsville, 4½ miles southwest of; chisel mark on bowlder at intersection of roads, marked B.M. 53, painted "U.S.G.S. 781"	780.25
Batchellerville; bronze tablet set in southwest corner of Presbyterian church foundation wall, marked "771 ALBANY"	769.989
Batchellerville, ¾ mile north of; bench mark is on old State bench mark on bowlder at intersection of roads, marked "B.M. 56 U.S.G.S. 739"	738.95
Batchellerville, ⅓ mile south of; chisel mark on bowlder in fence on east side of road, marked U.S.G.S. 770"	769.89
Northampton, ⅜ mile northeast of; bench mark is on old State bench mark; chisel mark on bowlder on west side of road, marked "B.M. 61, U.S.G.S. 774"	773.54
Northampton, 3.1 miles northeast of; chisel mark on bowlder (old State bench mark) on east side of road near yellow house, marked "B.M. 63, U.S.G.S. 800"	799.38
Northampton, 2.5 miles northeast of; chisel mark on bowlder about 1,500 feet north of schoolhouse at road intersection, marked "B.M. U.S.G.S. 806"	805.13
Northampton, 1¾ miles northeast of; chisel mark on bowlder on east side of road marked "U.S.G.S. B.M. 791"	790.55

	Feet.
Northampton, bench mark is on bronze tablet in northeast corner of Presbyterian church, marked "790 ALBANY"	788.975
Edinburg, ½ mile north of; chisel mark on bowlder east side of road 600 feet south of road intersection, marked "U.S.G.S. 796"	795.84
Edinburg; chisel mark on large bowlder at road corners at southeast end of bridge, marked "U.S.G.S. B.M. 881"	880.72
Edinburg, ¾ mile southwest of; chisel mark on bowlder near yellow house, south side of road, marked "B.M. U.S.G.S. 935"	934.03
Edinburg, 1.6 miles northwest of; chisel mark on bowlder in wall southwest corner of road corners, marked "U.S.G.S. B.M. 1031"	1,030.75
Northville, 1¾ miles southeast of; chisel mark on large granite bowlder north side of road 500 feet east of intersection of roads, marked "B.M. U.S.G.S. 941"	940.28
Northville, ¾ mile southeast of; chisel mark on large bowlder north side of road 1,000 feet east of road intersection, marked "B.M. U.S.G.S. 845"	844.73
Northville, bench mark on aluminum tablet in northeast corner of M. E. church, corner of Main and Washington streets, marked "802 ALBANY"	801.932

HADLEY TO CORINTH.

Hadley, 2 miles south of; chisel mark on large bowlder on west side of road 75 feet southeast of white house	603.57
Corinth, 1½ miles northeast of; 400 feet southwest of road intersection, chisel mark on stone in wall of bridge over creek, marked "B.M. U.S. G.S. 562"	561.63
Corinth, ½ mile north of; chisel mark on bowlder in front of white house owned and occupied by George Miner, painted "B.M. U.S.G.S. 558"	558.47
Corinth; bench mark on aluminum tablet set in northwest corner of Baptist church, marked "626 ALBANY"	625.630

HADLEY TO THURMAN, VIA WARRENSBURG.

Hadley, 1 mile from; chisel mark on stepping stone in front of Catholic Church in Luzerne, marked "B.M. U.S.G.S. 665"	664.60
Hadley, 2 miles north of; chisel mark on large bowlder at road intersection west side of road, marked "B.M. U.S.G.S. 662"	661.59
Hadley, 3 miles north of; chisel mark on ledge of rock 20 feet west of road, 500 feet north of road intersection, marked "B.M. B.M., U.S.G.S. 699"	698.64
Hadley, 4 miles north of; chisel mark on bowlder 50 feet north of road intersection and southeast of road, marked "B.M. U.S.G.S. 699"	698.72
Hadley, 5 miles north of, on Warrensburg road; chisel mark on bowlder west side of road, 200 feet north of bridge spanning Howe Creek, 150 feet north of house, marked "B.M. U.S.G.S. 746"	745.57
Hadley, 5½ miles northeast of, on Warrensburg road; west side of road, bench mark on bronze tablet set in ledge of rock 300 feet south of house at edge of woods, marked "834 ALBANY"	833.598
Hadley 7½, miles north of, chisel mark on bowlder north of road; 150 feet north of house, marked "B.M. U.S.G.S. 933"	932.64
Hadley, 8½ miles north of, on Warrensburg road; chisel mark on bowlder in front of house, marked "B.M. U.S.G.S. 1060"	1,060.22
Hadley, 9½ miles north of; chisel mark on bowlder south side of, 200 feet north of barn, marked "B.M. U.S.G.S. 1332"	1,331.77

	Feet.
Hadley, 10½ miles north of, on Warrensburg road; chisel mark on ledge 1,200 feet north of house, marked "B.M. U.S.G.S. 1367"	1,367.16
Hadley, 11½ miles north of; chisel mark on bowlder west side of road 200 feet northeast of house, marked "B.M. U.S.G.S. 1291"	1,290.86
Hadley, 12½ miles north of; chisel mark on bowlder east side of road 300 feet northeast of house, marked "B.M. U.S.G.S. 1180"	1,179.82
Hadley, 13½ miles northeast of, on Warrensburg road; chisel mark on bowlder on north side of road 200 feet east of house, marked "B.M. U.S.G.S. 1265"	1,265.28
Hadley, 14½ miles northeast of; chisel mark on bowlder 75 feet south of road, 400 feet north of house, marked "B.M. U.S.G.S. 1015"	1,015.17
Hadley, 15½ miles northeast of, in the village of Warrensburg; chisel mark on bowlder at bridge spanning the Schroon River, west side of road, 75 feet west of west end of bridge, marked "B.M. U.S.G.S. 684"	684.08
Warrensburg, on Main street; bench mark on bronze tablet set in southeast corner of stone building used as post-office, marked "749"	748.595
Warrensburg; bench mark on top of hydrant in front of office of Pasco & Davidson's planing mill, marked "B.M. U.S.G.S. 662"	661.80
Warrensburg, 2½ miles southwest of post-office, on Thurman road; chisel mark on bowlder in front of white house south side of road, marked "B.M. U.S.G.S. 666"	665.42
Warrensburg, 3¼ miles southwest of; chisel mark on small bowlder in gravel bank on south side of road to Thurman Station, marked "B.M. U.S.G.S. 625"	625.16
Thurman station, ½ mile north of; near white house at second road crossing north of station, chisel mark on bowlder west side of Adirondack Railway track, marked "B.M. U.S.G.S. 623"	623.02
Thurman station, 1¼ miles north of; bench mark on aluminum tablet set in abutment of bridge 13, Adirondack Railway	627.837

STONY CREEK TO KNOWLHURST.

Stony Creek, 0.4 mile south of; coping stone of bridge seat at northwest corner of steel girder bridge No. 10 over Stony Creek, aluminum tablet marked "600 ALBANY 1899"	600.000
Stony Creek railroad station, ½ mile southwest of, on road leading to Stony Creek; chisel mark on bowlder north side of road, marked "B.M. U.S.G.S. 625"	625.46
Stony Creek, 1½ miles southwest of railroad station; chisel mark on bowlder north side of road leading to Stony Creek, marked "B.M. U.S.G.S. 692"	691.99
Stony Creek, 2½ miles northwest of; chisel mark on bowlder south side of road, 150 feet southeast of white house and 100 feet south of monument marked "Cameron" at; marked "B.M. U.S.G.S. 819"	819.18
Stony Creek, ½ mile southwest of post-office at; chisel mark on bowlder north side of road, 150 feet north of yellow house, marked "B.M. U.S.G.S. 911"	911.36
Stony Creek, ½ mile northwest of, on road leading to Knowlhurst; chisel mark on bowlder north side of road, 500 feet northwest of house, marked "B.M. U.S.G.S. 874"	874.05
Stony Creek post-office, 1½ miles northwest of; chisel mark on bowlder west side of road at edge of woods, 1,500 feet north of white house, marked "B.M. U.S.G.S. 971"	970.89

	Feet.
Stony Creek post-office, 2½ miles northwest of, on Knowlhurst road; chisel mark on bowlder west side of road, 1,400 feet northwest of white house, marked "B.M. U.S.G.S. 1098"	1,097.89
Stony Creek post-office, 3½ miles northwest of; chisel mark on bowlder west side of road, 1,300 feet northwest of house in clearing marked "B.M. U.S.G.S. 1307"	1,307.16
Stony Creek post-office, 4½ miles northwest of; chisel mark on bowlder north side of road, 80 feet east of house on knoll near Knowlhurst, marked "B.M. U.S.G.S. 1403"	1,402.69
Stony Creek, 5½ miles northwest of; chisel mark on bowlder at white house owned by John Q. Adams, marked "B.M. U.S.G.S. 1511"	1,511.04
Knowlhurst, bench mark on bronze tablet set in foundation wall of Methodist Episcopal church at; southeast corner; marked "1583 ALBANY"	1,583.948

HERKIMER, HAMILTON, ST. LAWRENCE, AND FRANKLIN COUNTIES.

Nehasane, Raquette Lake, Blue Mountain, Tupper Lake, and Long Lake Quadrangles.

The elevations in the following list are referred to mean sea level by using the Gristmill bench mark at Albany as a datum. They are based on bench marks at Long Lake village and Fulton Chain station, established during the past four seasons in the course of extended circuits of primary leveling. The initial point at Long Lake is a copper plug marked "U.S.G.S.B.M. 1663." (See page 257 of Appendix to Eighteenth Annual Report.) Orginally this bench mark was dependent on an assumed railroad datum at North Creek, but in 1898 it was raised 0.306 foot (see page 344 of Appendix to Twentieth Annual Report) through adjustment with a line of primary levels brought from Herkimer. In 1899 precise levels of E. L. McNair (see page 383, this report) from Schenectady to North Creek gave a final elevation to North Creek bench mark, which raised it 0.436 foot, thus making the final correction to the Long Lake bench mark, as published in the Appendix to the Eighteenth Annual Report, amount to +0.742 foot, and the final adjusted elevation of the above-described bench mark is accepted as 1,658.511 feet above mean sea level.

At the other end of this circuit of levels is the initial check bench mark at Fulton Chain, marked "R 1712." (See page 355 of Appendix to Twentieth Annual Report.) The elevation of this bench mark is now raised 0.395 foot, which is a mean difference found in the lines from North Creek via Indian Lake and Long Lake, and that from North Creek via Cedar Lakes and Honnedaga Lake, and that from Utica direct to Fulton Chain. The final accepted elevation for the above-described bench mark is, therefore, 1,711.680 feet above mean sea level.

All elevations between Long Lake and Newcomb, Indian Lake and Long Lake, and Indian Lake and Wakely dam, as published in the Appendix to the Eighteenth Annual Report and corrected by note inserted in the Appendix to the Twentieth Annual Report, have been raised and readjusted and are published in the following list in accordance with the results of the additional circuit closures procured during the field seasons of 1897 and 1899. The elevations to the south of Fulton Chain, Wakely dam, and North Creek, as published in the preceding annual reports above cited, are not readjusted herewith. Those elevations, as corrected in the Appendix to the Twentieth Annual Report, are subject to further varying corrections from zero to +.4 feet.

The leveling of the past season was executed by Messrs. W. W. Gilbert and A. W. Gill, levelmen, under the general direction of Mr. A. M. Walker, topographer.

All bench marks dependent on the leveling of this season are marked with the letters "ALBANY" in addition to the figures of elevation.

FULTON CHAIN, VIA NEW YORK CENTRAL AND HUDSON RIVER RAILROAD, TO LONG LAKE WEST.

	Feet.
Fulton Chain, 5 feet north of Wakley's Hotel, 8 feet east of railroad track; bronze table set in south face of bowlder, marked "1712 R."	1,711.680
Fulton Chain, 1 mile north of; nail in top north side of post supporting 114-mile post, marked on tie "U.S.G.S. 1717 B.M."	1,717.87
Fulton Chain, 2 miles north of; nail on top south side of post supporting 113-mile post, marked on tie "G.S. B.M. 1726"	1,726.61
Clearwater, 2 miles south of; nail in top north side of post supporting 111-mile post, marked on tie "G.S. B.M. 1736"	1,734.60
Clearwater, 1 mile south of; nail in top south side of post supporting 110-mile post, marked on tie "G.S. B.M. 1757"	1,755.49
Clearwater, 600 feet south of, 35 feet east of track; bronze tablet set in west face of large bowlder, marked "1753 ALBANY"	1,751.737
Clearwater, 1 mile north of; nail in top north side of post supporting 108-mile post, marked on tie "1805 G.S. B.M."	1,803.34
Clearwater, 2 miles north of; chisel mark on rock west side of track, 5 feet from track, 5 feet north of 107-mile post	1,865.42
Big Moose, 2 miles south of; nail in top south side of post supporting milepost 106, marked on tie "G.S. B.M. 1923"	1,921.90
Big Moose, 1 mile south of chisel mark on rock 5 feet east of track and 5 feet north of milepost 105	1,971.98
Big Moose, 110 feet east of point of switch at east end of side track, 40 feet south of main track, 25′ west of west line of Hennessey's Hotel; bronze tablet set in northwest face of large bowlder, marked "2036 ALBANY"	2,034.15
Big Moose, 1 mile north of; nail on top north side of post supporting 103-mile post, marked on tie "G.S. B.M. 2026"	2,024.46
Big Moose, 2 miles north of; nail in top south side of post supporting 102-mile post, marked on tie "G.S. B.M. 1946"	1,944.23
Woods Lake, 1½ miles south of; nail in top south side of post supporting 101-mile post, marked on tie "G.S. B.M. 1891"	1,889.12
Woods Lake, 1½ miles south of; nail in top north side of post supporting 100-mile post, marked on tie "G.S. B.M. 1894"	1,892.39
Woods Lake, ⅜ mile south of; 62 rails south of station; 575 feet north of 100-mile post; 125 feet south of small stream; 20 feet west of track; bronze tablet set in northeast face of large bowlder, marked "1881 ALBANY"	1,879.604

	Feet.
Woods Lake, ½ mile north of; nail in top north side of post supporting 99-mile post, marked on tie "G.S. B.M. 1871"	1,868.94
Woods Lake, 1½ miles north of; chisel mark on top of bowlder 10 feet north of 98-mile post	1,872.90
Beaver River, 1¾ miles south of; nail in top north side of post supporting 97-mile post, marked on tie "G.S. B.M. 1814"	1,812.00
Beaver River, ¾ mile south of; nail in top north side of post supporting 96-mile post, marked on tie "G.S. B.M. 1735"	1,733.25
Beaver River; aluminum tablet set in east face of foundation stone under south support, east side of railroad water tank, marked "1693 ALBANY"	1,691.689
Beaver River, 1¼ miles north of; nail in top south side of post supporting 94-mile post, marked on tie "G.S. B.M. 1681"	1,679.30
Beaver River, 2¼ miles north of; nail in top north side of post supporting 93-mile post, marked on tie "G.S. B.M. 1697"	1,695.04
Keepawa, 1¾ miles south of; nail in top south side of post supporting 92-mile post, marked on tie "G.S. B.M. 1686"	1,684.86
Keepawa, 1 mile south of; chisel mark on bowlder; bowlder 20 feet east of track and 20 feet north of bridge over the Beaver River	1,695.68
Keepawa station, 38 rails' lengths north of; 75 feet north of 90-mile post; 100 feet west of track; aluminum tablet set in east face of large bowlder, marked "1722 ALBANY"	1,720.794
Keepawa, 1¼ miles north of; chisel mark on small bowlder 2½ feet west and 1½ feet north of 89-mile post	1,733.30
Keepawa, 2¼ miles north of; chisel mark on top of bowlder opposite 88-mile post, 7 feet south of post, marking sections	1,775.58
Nehasane, 1⅛ miles south of; chisel mark on ledge of rock 5 feet east of track and 12 feet south of 87-mile post	1,779.99
Nehasane, ⅛ mile south of; nail in top north side of post supporting 86-mile post	1,821.05
Nehasane Lake, surface of water	1,714.
Nehasane, 200 feet south of Mr. Ames's house (Nehasane station), 20 feet west of main track; aluminum tablet set in east face of ledge of rock, marked "1789 ALBANY"	1,787.356
Nehasane, 1 mile north of; chisel mark on top of large bowlder; bowlder 260 feet south of 84-mile post and 8 feet east of track	1,751.94
Bog Lake, ¾ mile south of; nail in top of south side of post supporting 83-mile post, marked on tie "G.S. B.M. 1751"	1,749.62
Bog Lake, 0.1 mile north of; 90 feet north of 82-mile post; 45 feet east of track; nail in root southwest side of birch tree	1,755.75
Bog Lake, 1¼ miles north of; 35 rails' lengths north of milepost; 81 miles from Malone; 35 feet west of track; aluminum tablet set in east face of large bowlder, marked "1764 ALBANY"	1,762.499
Long Lake West, 1⅛ miles south of; spike driven in west side of first telegraph pole north of 80-mile post	1,764.76
Long Lake West, ⅛ mile south of; chisel mark on bowlder 8 feet west of track and 15 feet south of 79-mile post	1,787.45
Long Lake West, 215 feet north of People's Hotel, 30 feet east of track; aluminum tablet set in west face of outcrop of rock, marked "1789 ALBANY"	1,787.613

LONG LAKE WEST, VIA CHILDWOLD, TUPPER LAKE, WAWBEEK, AND AXTON, TO FOOT OF LONG LAKE.

	Feet.
Long Lake West, 1 mile north of; center chiseled square on outcrop of rock opposite south point of switch of section 18, 2½ feet below grade on left side of track, marked "A"	1,775.18
Long Lake West, 2 miles north of; center chiseled square on small rock cut, 120 yards north of milepost 76 on right side of track	1,729.58
Long Lake West, 3 miles north of; nail driven in south side of bottom post of milepost 75	1,724.03
Horseshoe station, 1 mile south of; center chiseled square on shoulder of rock east side of track 6 feet from, 3 feet above, and 110 yards north of milepost 74	1,733.44
Horseshoe station; aluminum tablet set in east face of large bowlder at, about 1 foot above ground, and 50 feet north of station and 50 feet west of track, marked "1739 A"	1,738.003
Horseshoe, 1 mile north of; center chiseled square on bowlder west side of track, 17 rails north of milepost 72	1,761.75
Horseshoe, 2 miles north of; center chiseled square on bowlder right side of track, 20 feet north of milepost 71	1,754.91
Horseshoe, 3 miles north of; center chiseled square on bowlder on left of track, 34 rails north of milepost 70, marked "B"	1,706.28
Pleasant Lake station, C.; 13 rails north of milepost 69, center chiseled square on top of bed rock, east side of track, in small rock cut, 3 feet above track, marked "C"	1,677.87
Pleasant Lake, 1 mile north of; 13 rails north of milepost 68; center chiseled square on left side, in small rock cut, on bed rock 2½ feet above track, marked "D"	1,684.82
Childwold station, ½ mile south of; center chiseled square on top of bowlder, left side track, at north end of long cut north of milepost 67	1,709.92
Childwold, U.S.G.S.; aluminum tablet set in face of rock cut, 40 rails south of station on left side track, marked "ALBANY 1713"	1,712.990
Childwold, 52 rails north of; center chiseled square on top of white bowlder on right, marked "E"	1,728.86
Childwold, 1½ miles north of; top of bolt on south side milepost 65	1,711.75
Piercefield station, 150 feet west of; center chiseled square on top of brown bowlder, south side track, marked "F"	1,673.59
Piercefield station, ¾ mile east of and 15 feet south of milepost 63; center chiseled square on top of large brown bowlder, right side of track, marked "G"	1,640.36
Piercefield station, 1¾ miles north of and 580 feet south of milepost 62; cut on the top edge of a ledge of rock on the right side of track, marked "H"	1,599.96
Tupper Lake Junction, 2 miles west of and about 45 feet east of point of Underwood switch; center chiseled square on bowlder left side of track, marked "I"	1,558.72
Tupper Lake Junction, 1 mile west of; top of bolt on north side milepost 60.	1,554.56
Tupper Lake Junction, aluminum tablet set in foundation to water tank New York Central and Hudson River Railroad, Adirondack Division, marked "1555 ALBANY"	1,555.857
Tupper Lake post-office, center chiseled square on top of bed rock, about 60 feet northeast of American House, marked "B.M.J. U.S.G.S."	1,556.58
Tupper Lake, New York, ¾ mile east of; 150 feet west of unpainted house, center chiseled square on bowlder south side of road and 10 feet south of telephone pole, marked "K"	1,668.46

	Feet.
Tupper Lake, 1¾ miles east of; center chiseled square on top of large bowlder, left side, close to wheel track, marked "L"	1,631.82
Tupper Lake, 2¾ miles east of; chiseled square on top of bowlder south side of road at angle to left, marked "M"	1,703.02
Tupper Lake, 3¾ miles east of; chiseled square on top of large bowlder 6 feet high, north side road at crossing of Cornell forestry west line, marked "N"	1,570.71
Tupper Lake, 4½ miles east of; chiseled on top of bowlder north side of road, small bowlder on top, marked "O"	1,615.33
Wawbeek, ½ mile west of; chiseled square on top of bowlder south side of road, close to wheel track, marked "Q"	1,691.71
Wawbeek, 0.6 mile southeast of; chiseled square on top of black bowlder west side road, close to wheel track, marked "R"	1,660.31
Wawbeek, 1½ miles southeast of and in the first clearing west of; chiseled square on top of bowlder 4 feet high, north side road, 100 feet west of stream	1,634.89
Axton post-office, 2 miles north of and 90 feet south of 2 milepost to Axton; chiseled square on ledge of rock east side road, marked "T"	1,610.76
Axton post-office, 1 mile north of; nail driven in telephone pole opposite red hipped-roofed barn	1,588.99
Axton post-office, 0.6 mile south of; center chiseled square on bowlder at forks of the road, marked "U"	1,558.54
Axton, 1½ miles south of; chiseled square on top of bowlder in the middle of the road marked "V"	1,579.81
Axton, 2.8 miles south of; chiseled square on top of rock in road, marked "W"	1,642.10
Raquette Falls, 1 mile north of Talbot's house and 75 yards north of Corduroy bridge; chiseled square on bowlder in middle of road, marked "X"	1,582.98
Raquette Falls; chiseled square on top of bowlder 150 feet west of Talbot's house, marked "Y"	1,574.50
Raquette Falls, upper end of carry; chiseled square in ledge of rock flush with ground, 30 feet northeast of large birch, marked "Z"	1,631.58
Raquette Falls; aluminum plug set in bowlder 150 feet west of Martin Talbot's, stamped "ALBANY 1874"	1,574.46
Long Lake, island in lower end of; aluminum plug set in top of bowlder 420 feet west of house owned and occupied by Amos Robinson, marked "1638 ALBANY"	1,638.037

LONG LAKE WEST TO LONG LAKE, VIA LITTLE TUPPER LAKE.

Long Lake West, 1 mile east of; 80 feet east of 18 milepost, nail in root west side of beech tree, south side of road	1,872.50
Long Lake West, 2 miles east of; chisel mark on bowlder in stream, 8 feet north of road and 40 feet east of 17-mile post	1,832.41
Long Lake West, 3 miles east of; chisel mark on bowlder in front of 16-mile post	1,925.05
Long Lake West, 4 miles east of; opposite 15-mile post, 10 feet from road, in southeast face of large bowlder; aluminum tablet, marked "1839 Albany"	1,837.997
Little Tupper Lake, 3½ miles west of; chisel mark on bowlder in front of 14-mile post	1,799.69
Little Tupper Lake, 2½ miles west of; chisel mark on part of shattered bowlder at north edge of road, 25 feet east of 13-mile post	1,780.0
Little Tupper Lake, 1½ miles west of; nail in root southwest side of large birch tree; tree 75 feet east of 12-mile post and 12 feet north of road	1,790.78

	Feet.
Litte Tupper Lake, at corner of road to keeper's house; 1 mile west of lake; 40 feet west of corner north side of road; chisel mark on bed rock, marked "U.S.G.S. B.M. 1748"	1,747.02
Little Tupper Lake, head of; at Loomis's camp, 150 feet southeast of camp, 25 feet from barn; north face of large bowlder; aluminum tablet, marked "1760 ALBANY"	1,758.272
Little Tupper Lake, ⅛ mile east of; 115 feet west of 10 milepost; 8 feet north of road; 25 feet west blacksmith's shop at Moynehan's lumber camp; west face of large bowlder; aluminum tablet, marked "1739 ALBANY"	1,737.996
Little Tupper Lake, 1¼ miles east of; 15 feet west of 9-mile post; 15 feet south of road; chisel mark on large bowlder	1,940.80
Little Tupper Lake, 2¼ miles east of; in road ditch, north side of road, 125 feet west of 8-mile post; chisel mark on bed rock	1,967.47
Little Tupper Lake. 3¼ miles east of; in road ditch, south side of road, 65 feet east of 7-mile post; chisel mark on high portion of rock	1,946.05
Big Brook, 1⅛ miles west of; north side of road, 10 feet east of 6-mile post; chisel mark on bowlder	1,828.22
Big Brook, 250 feet north of; 12 feet east of road; west face of large bowlder; aluminum tablet, marked "1722 Albany"	1,720.791
Long Lake, 4 miles west of; in road ditch, south side of road, 15 feet west of 4 milepost; chisel mark on bowlder	1,737.99
Long Lake, 3 miles west of; 3 feet south of road and 20 feet west of 3-mile post; chisel mark on bowlder	1,787.03
Long Lake, 2 miles west of; 10 feet north of road; 25 feet west of 2-mile post; chisel mark on bed rock	1,782.51
Long Lake, 1 mile west of; in front of 1-mile post; chisel mark on bowlder	1,742.98
Long Lake, front line of Lake House; 35 feet south of house; chisel mark on bowlder (Colvins B.M. 71 A.)	1,636.47

BRANDRETH STATION, VIA BRANDRETH AND RAQUETTE LAKES TO GROVE HOUSE, LONG LAKE.

Brandreth station, ½ mile east of; chisel mark on bowlder, north side of road	1,772.26
Brandreth station, 2 miles east of; nail in root of stump, north side of road at 2-mile post	1,845.59
Brandreth station, 3 miles east of; at spring south side of road, just east of 3-mile post, chisel mark on bowlder	1,996.13
Brandreth Lake, 3½ miles west of; nail in root of stump north side of road, west of Deer Pond stream	1,899.4
Brandreth Lake, 2½ miles west of; nail in root of birch tree at 5-mile post	1,895.70
Brandreth Lake, 1¼ miles west of; 100 feet west of West Pond stream, south side of road, chisel mark on bowlder	1,844.39
Brandreth Lake, Brandreth Camps, northwest corner of clearing, 10 feet east of road, 40 feet south of edge of woods, south face of bowlder, aluminum tablet, marked "1915 ALBANY"	1,913.05
North Pond, surface of water	1,860.00
Big Salmon Lake, surface of water	1,800.00
South Pond, surface of water	2,008.00
East Pond, surface of water	1,957.00
Brandreth Lake, surface of water	1,878.00
Brandreth Camp, 1¾ miles southeast of; chisel mark on bowlder at small blazed cedar tree west side of road	1,885.11

	Feet.
Brandreth Lake, foot of; 30 feet west of State road, 12 feet south of Brandreth Outlet, aluminum tablet in northeast face of large bowlder, marked "1884 ALBANY"	1,882.482
Brandreth Lake, township line, south side of road, 30 feet west of spring, chisel mark on bowlder	1,871.61
Woods Camp, Forked Lake, 4 miles west of; south side of road, chisel mark on bowlder, at old 4-mile post	1,864.23
Woods Camp, 3 miles west of; chisel mark on bowlder in road at old 3-mile post	1,868.31
North Bay of Raquette Lake; chisel mark on bowlder at southwest corner of Carry and State road	1,772.20
Woods Camp. 1 mile west of; just east of clearing, south side of road; chisel mark on bowlder in road	1,831.80
Woods Camp, 10 feet east of east line of house, 105 feet in front of house; chisel mark on bowlder	1,841.38
Raquette Lake, Antler's Hotel, 30 feet west of ice house; aluminum tablet in bed rock, marked "1811 ALBANY"	1,809.752
Raquette, Forked Lakes Carry, at southwest corner of Carry and State road, 5 feet from road, 15 feet from Carry, in northeast face of large bowlder; aluminum tablet, marked "1796 ALBANY"	1,796.246
Long Lake, head of; 2¾ miles southwest of; at fork in State road where road goes to Forked Lake, 130 feet east of fork, 50 feet south of road; north face of large bowlder, aluminum tablet, marked "1726 ALBANY"	1,726.340
Buttermilk Falls, at northwest corner of road to dam; chisel mark on bowlder	1,699.69
Grove House, 1½ miles southwest of; 100 feet south of curve to right coming from Forked Lake, at summit of hill; chisel mark on bed rock in road ditch, east side of road	1,764.29
Salmon Pond Stream, at southwest corner of highway bridge; chisel mark on bowlder	1,643.47
Grove House, 500 feet east of; near fence, chisel mark on large bowlder	1,671.95

BLUE MOUNTAIN LAKE TO UPPER DOCK, MARION RIVER CARRY.

Blue Mountain schoohouse, 1 mile west of; center of chiseled square on top of bowlder on left side of road, about 150 yards south of Prospect House and 25 yards north of livery stable	1,836.15
Blue Mountain schoolhouse, 2½ miles from Pioneer Bridge, over outlet of Blue Mountain Lake, center of chiseled square on next to the top stone of the northeast wing wall	1,803.38
Blue Mountain schoolhouse, 3 miles west of; center of chiseled square on bowlder in road about 20 feet from shore of Eagle Lake, and 3½ feet above it	1,792.22
Blue Mountain school, 4 miles west of; center of chiseled square cut in slope of an outcrop of rock on the south side of the road; outcrop is about 40 feet long	1,812.09
Blue Mountain school, 5 miles west of; center of chiseled square on bowlder on the south side of the road close to wheel track and within 2 feet of signboard saying, "7 miles to Pine Knot"	1,825.03
Marion River carry, aluminum tablet set in the east face of a ledge of rock on the north side of the road opposite the upper dock of; marked "ALBANY 1793"	1,793.945
Utowana Lake, surface of water	1,788.72

INDIAN LAKE TO CEDAR RIVER.

	Feet.
North River, 500 feet east of 14-mile post from; square chisel mark on bowlder 8 feet to left of and 2.5 feet above center of road, about 180 feet east of bridge over small stream, flowing north	1,683.22
Cedar River, iron bridge over; downstream end of west abutment, square chisel mark	1,670.21
North River, 185 feet south of west of 15-mile post from; square chisel mark on bowlder 70 feet to right of and 4.5 feet above center of road	1,683.52

CEDAR RIVER HOUSE TO WAKELY DAM.

Main road, ¾ mile from; square chisel mark on bowlder 20 feet to right of and 1.7 feet above center of road, 275 feet back from small stream	1,694.51
Main road, 1¾ miles from; square chisel mark on bowlder 6 feet to left of and 4.7 feet above center of road	1,743.85
Main road, 3 miles from; square chisel mark on bowlder 30 feet to right of and 2.6 feet above center of road, 365 feet back from log house on left of road	1,773.37
Main road, 3⅞ miles from; square chisel mark on outcrop 8 feet to right of and 1.6 feet above center of road, 210 feet back from summit	1,913.02
Main road, 5⅛ miles from; square chisel mark on large bowlder 28 feet to left of and 5.8 feet above center of road, 500 feet back from white frame schoolhouse on right of road	1,866.76
Potter's house, ¾ mile beyond; square chisel mark on bowlder 21 feet to left of and 2.9 feet above center of road, 200 feet north of east of partly log and partly frame house on left of road	1,876.41
Brown's house, ¾ mile beyond and 7⅝ miles from main road; copper plug set in bowlder 15 feet to right of and 5.3 feet above center of road, 20 feet north of bridge over small stream flowing to left, marked "U.S.G.S. B.M. 1918"	1,913.355
Brown's house, 1⅛ miles beyond; square chisel mark on bowlder 5 feet to left of and 2.8 feet above center of road, 300 feet beyond summit	1,960.44
Brown's house, 1⅞ miles beyond; square chisel mark on bowlder 7 feet to right of and 3.5 feet above center of road, 50 feet northeast of pole bridge over brook flowing to left	2,033.09
Brown's house, 2⅞ miles beyond; square chisel mark on bowlder 7 feet to right of and 3.9 feet above center of road, 7 feet southeast of blazed beech tree	2,084.72
Wakely Pond outlet, 12 feet beyond bridge over; square chisel mark on bowlder 4 feet to right of and 1 foot above center of road	2,093.59
Wakely dam; copper plug in bowlder 25 feet east of north of log house at, marked "U.S.G.S. 2124 Ft. B.M."	2,119.546

CEDAR RIVER HOUSE TO FOREST HOUSE.

Fifteen-mile post, ⅝ mile beyond; bowlder 7 feet to right of and 1.8 feet above center of road, square chisel mark	1,750.91
Sixteen-mile post, ¼ mile beyond; bowlder 8 feet to left of and 0.4 foot above center of road, square chisel mark	1,803.70
Seventeen-mile post, ¾ mile beyond; square chisel mark on outcrop 8 feet to left of and 1.4 feet above center of road	1,922.17
Seventeen-mile post, ⅞ mile beyond; square chisel mark on bowlder 14 feet to left of and 3.6 feet above center of road	1,895.36
Eighteen-mile post, ½ mile beyond; square chisel mark on bowlder 9 feet to right of and 3.8 feet above center of road	1,892.41

	Feet.
Eighteen-mile post, 1 mile beyond; square chisel mark on bowlder 7 feet to left of and 2.8 feet above center of road, 190 feet back from brook flowing to right	1,773.69
Forest House, 19¾ miles from North River; copper plug in outcrop 25 feet to north of west of northwest corner of barroom; marked "U.S.G.S. 1941 Ft. B. M."	1,937.027

FOREST HOUSE TO BLUE MOUNTAIN LAKE.

Denmark's house, 300 feet southeast of; 20⅝ miles from North River; square chisel mark on bowlder 16 feet to right of and 3.4 feet above center of road	1,875.47
North River, 21¼ miles from; square chisel mark on bowlder 7 feet to right of and 0.9 foot above center of road	1,775.02
Rock River, bridge over, 21⅝ miles from North River; square chisel mark on downstream end of easterly abutment	1,774.35
North River, 23¾ miles from; square chisel mark on large bowlder 12 feet to left of and 2.4 feet above center of road, at point of crossing of swamp	1,773.02
Blue Mountain Lake House, ⅛ mile back from; square chisel mark in recess, westerly end of large bowlder 7 feet to right of and 2.6 feet above center of road at point 125 feet southeast of junction of main road and road leading to Prospect House	1,786.73

BLUE MOUNTAIN LAKE TO LONG LAKE.

Blue Mountain Lake, foundation of new schoolhouse; cross in copper tablet set in second stone from southwest corner of second course from top, marked "1810"	1,805.50
Blue Mountain Lake schoolhouse, ⅝ mile beyond; square chisel mark on bowlder 7 feet to left of and 3 feet above center of road, 65 feet back from watering trough on right	1,939.79
Blue Mountain Lake schoolhouse, 1⅛ miles from; square chisel mark on bowlder 15 feet to right of and 0.3 foot above center of road, opposite Duprez's house	2,163.70
Blue Mountain Lake schoolhouse, 1⅝ miles from; square chisel mark on bowlder 6 feet to left of and 1.5 feet above center of road, 75 feet beyond small stream flowing to left	2,073.46
Blue Mountain Lake schoolhouse, 2¼ miles from; square chisel mark on bowlder 8 feet to right of and 1.9 feet above center of road about 850 feet beyond brook flowing to left	2,072.40
Bennett's house, ⅜ mile beyond; square chisel mark on bowlder 8 feet to left of and 1 foot above center of road	1,946.70
Salmon River, ⅛ mile beyond; square chisel mark on bowlder 6 feet to right of and 2.8 feet above center of road	1,821.83
Salmon River, ¾ mile beyond; square chisel mark on bowlder 8 feet to left of and 2.1 feet above center of road, 515 feet beyond small stream flowing to left and 138 paces back from 6-mile post	1,798.10
Long Lake, 5½ miles from; copper plug in bowlder 12 feet to left of and 2.1 feet above center of road, marked "U.S.G.S. 1855 Ft. B.M."	1,850.989
Long Lake, 4¾ miles from; square chisel mark on bowlder 11 feet to left of center of road, 35 feet beyond brook flowing to left	1,782.33
Long Lake, 4½ miles from; square chisel mark on outcrop 6 feet to left of and 0.4 foot above center of road, 75 feet back from ledge on left	1,819.08
Long Lake, 3½ miles from; square chisel mark on large bowlder near fence, 500 feet east of South Grove House	1,671.95

	Feet.
Three-mile post, 410 feet beyond; square chisel mark on projecting stone at northerly corner of foundation of red-roofed frame house on right of road	1, 728. 17
Long Lake, 1¾ miles from; square chisel mark on outcrop, 7 feet to right of and 2.2 feet above center of road, 100 feet beyond log house on right	1, 671. 32
Long Lake, 1¼ miles from; square chisel mark on bowlder 8 feet to left of and 0.7 foot above center of road, 325 feet beyond brook flowing to left	1, 663. 36
Long Lake, 260 feet west of Sabattis's two-storied frame house; copper plug, set in west end of outcrop, 130 feet to left of center of road, marked "U.S.G.S. 1663 Ft. B.M."	1, 658. 511

LONG LAKE TO NEWCOMB.

Long Lake, ½ mile east of; square chisel mark on bowlder 11 feet to left of and 7 feet above center of road, 100 feet northeast of Shaw's sawmill	1, 739. 84
Long Lake, 1½ miles east of; square chisel mark on bowlder 30 feet to left of and 6 feet above center of road, 125 feet south of east of schoolhouse	1, 780. 77
Long Lake, 2¼ miles east of; square chisel mark on bowlder 10 feet to right of and 3.7 feet above center of road, 25 feet beyond plank culvert	1, 861. 96
Long Lake, 2⅝ miles from; square chisel mark on bowlder 8 feet to right of and 3 feet above center of road, 125 feet beyond pole culvert over drain	1, 861. 27
Long Lake, 3⅜ miles east of; square chisel mark and letter "A" on bowlder 12 feet to left of and 2.1 feet above center of road	1, 875. 32
Four-mile post, 35 feet back from; copper plug set in outcrop 14 feet to right of and 2.5 feet above center of road, marked "U.S.G.S. 1863 Ft. B.M."	1, 858, 291
Long Lake, 4⅝ miles from; square chisel mark on bowlder 6 feet to right of and 1.7 feet above center of road	1, 795. 21
Long Lake, 5½ miles east of; square chisel mark on bowlder 22 feet to left of and 1.7 feet below center of road, 275 feet beyond small brook flowing to left	1, 840. 82
Six-mile post, 65 feet east of; square chisel mark on bowlder 6 feet to right of and 0.9 foot above center of road	1, 838. 63
Seven-mile post, 200 feet east of; square chisel mark on bowlder 18 feet to left of and 12 feet above center of road	1, 783. 48
Long Lake, 7⅝ miles east of; square chisel mark on bowlder 6 feet to right of and 2.8 feet above center of road, 685 feet east of culvert over small stream flowing to left	1, 750. 46
Hudson River bridge; square chisel mark on top of coping at downstream end of west abutment	1, 563. 24
Sibley's garden, west of house; square chisel mark on bowlder at southwest corner of, between fence and road	1, 590. 04
Newcomb Methodist Church; copper plug in outcrop 85 feet northeast of door of; 16 feet to left of and 1.3 feet above center of road, marked "U.S.G.S. 1640 Ft. B.M."	1, 636. 877
Newcomb Hotel, ⅛ mile northeast of; square chisel mark on upstream end of east abutment of iron bridge over creek	1, 561. 37

LAKE ELEVATIONS IN VARIOUS TOWNSHIPS.

Hamilton County, Long Lake Township:	
Raquette Lake, surface ot water	1, 762
Grass Pond, surface of water	1, 860
South Sargent Pond, surface of water	1, 796

Hamilton County, Long Lake Township—Continued.	Feet.
Middle Sargent Pond, surface of water	1,831
North Sargent Pond, surface of water	1,825
Shallow Lake, surface of water	1,810
Pilcher Pond, surface of water	1,813
Cranberry Pond, surface of water	1,799
High Pond, surface of water	1,785
Plumbley Lake, surface of water	1,765
South Pond, surface of water	2,008
East Pond, surface of water	1,957
Big Salmon Lake, surface of water	1,800
North Pond, surface of water	1,860
Flatfish Pond, surface of water	1,788
Moose Pond, surface of water	1,781
New Pond, surface of water	1,842
Cary Pond, surface of water	1,763
Sutton Pond, surface of water	1,792
Bottle Pond, surface of water	1,814
Antediluvian Pond, surface of water	1,735
Little Tupper Lake, surface of water	1,717
Rock Pond, surface of water	1,721
Mud Pond, surface of water	1,733
Little Salmon Lake, surface of water	1,759
Owls Head Pond, surface of water	1,841
South Pond, surface of water	1,755
Bear Pond, surface of water	1,865
Clear Pond, surface of water	1,720
Thayers Lake, surface of water	1,780
Morehouse Township:	
Eighth Lake, surface of water	1,790
Lower Brown Track Pond, surface of water	1,768
Upper Brown Track Pond, surface of water	1,769
Bug Lake, surface of water	1,990
Indian Lake Township:	
Mud Pond, surface of water	1,822
Blue Mountain Lake, surface of water	1,789
Eagle Lake, surface of water	1,788
Utowana, surface of water	1,788
Minnow Lake, surface of water	2,007
Crystal Lake, surface of water	1,872
Rock Pond, surface of water	1,770
Cascade Pond, surface of water	2,142
Stevens Pond, surface of water	1,957
Salmon Pond, surface of water	2,069
Wolf Pond, surface of water	2,363
O'Neil Flow, crest of dam	1,803
Arietta Township:	
Shed Lake, surface of water	1,904
Herkimer County, Wilmurt Township:	
Bucks Pond, surface of water	2,017
Franklin County, Altamont Township:	
Raquette Pond, surface of water	1,541
Harriettstown:	
Upper Saranac Lake, surface of water	1,570

	Feet.
St. Lawrence County, Hopkinton:	
Horseshoe Pond, surface of water	1,723
Lake Pleasant, surface of water	1,658
Otsego County, Richfield Springs:	
Schuyler Lake, surface of water	1,278
Cooperstown:	
Otsego Lake, surface of water	1,194

DUTCHESS AND ORANGE COUNTIES.

Schunemunk Mountain and Millbrook Quadrangles.

The elevations published in the following list are based on an aluminum tablet set in the front face of the city hall in Poughkeepsie and marked "173 ALBANY, 1899." The height of this bench mark is derived from a bench mark established by the United States Coast and Geodetic Survey line of precise levels between Sandy Hook and Albany. This is a brass bolt in an arch bridge near the Poughkeepsie railway station, the elevation of which is 42.926 feet above mean sea level. Dependent on these, it is accepted as being 172.583 feet above mean sea level.

The leveling was executed under the direction of Mr. C. C. Bassett, topographer, by Mr. Seth Van Loan, levelman.

All bench marks dependent on this datum are marked with the letters "ALBANY" in addition to their figures of elevation.

POUGHKEEPSIE.

	Feet.
Station; brass bolt keyed in fifth stone above ground, second step from east edge of column on north side of arch bridge, marked "+"	42.926
Intersection of Main street and Davies place; top of iron post	82.21
Intersection of Mill and North Bridge streets; top of hydrant	133.86
Intersection of North Bridge and Mansion streets; top of northeast curb	140.97
Intersection of Mansion and Washington streets; top of northwest curb	166.53
Intersection of Mansion and Gardner streets; top of northwest curb	168.13
Railroad repair shop; top of plug in 2-inch pipe set in ground 4 feet west of southwest corner of	181.77
Poughkeepsie and Eastern Railroad station; joint of rail nearest	181.81
City hall; tablet set in front face, marked "ALBANY 173"	172.583

POUGHKEEPSIE, VIA PLEASANT VALLEY AND SALT POINT, TO CLINTON CORNERS.

Poughkeepsie; point on corner first step, east abutment, south end of bridge over small creek, first east of station	172.53
Poughkeepsie; point on top stone of old culvert just east of Salt Point crossing	193.46
Poughkeepsie; point in circle on large rock between tracks of Poughkeepsie and Eastern Railroad and Poughkeepsie Bridge route and about ¼ mile east of Salt Point crossing	211.50
Poughkeepsie; point on top stone, northwest end of west abutment small bridge east of Van Wagners crossing	242.81
Poughkeepsie; point in corner third step from top, south end, west abutment, cattle pass and bridge at Landis's place, 1 mile west of Pleasant Valley	231.18

	Feet.
Pleasant Valley, ½ mile west of; top stone, north end, west abutment of small bridge	211.34
Pleasant Valley, ¾ mile east of; point of rock chisel marked "⊙ U.S."; north side track, rock cut ¼ mile east of crossing	227.47
Pleasant Valley, 2 miles east of; point on second stone from top of north end, east abutment, cattle pass	233.15
Pleasant Valley; tablet set in face of rock north side of track, 300 feet east of station, marked "ALBANY 211"	211.054
Salt Point, ¾ mile west of; point on face of stone near ground, about middle of west abutment Central New England Railway bridge over Poughkeepsie and Eastern Railroad, chisel marked "U. + S."	252.85
Salt Point; point on embedded stone edge of roadway just east of station	252.12
Salt Point, 1 mile east of; corner second stone from top of south end, west abutment, Leggett's Bridge	266.93
Clinton Corners; point on rock in edge of road between Wright's store and Brown's house	306.44
Clinton Corners; nail in locust stump under wall in front of Brown's house	303.5
Clinton Corners; Upton Lake, surface of water	303
Clinton Corners; tablet set in coping stone, north end, west abutment, bridge over Salt Point Creek, marked "ALBANY 244"	244.361

CLINTON CORNERS, VIA WASHINGTON HOLLOW AND SOUTH MILLBROOK, TO DOVER PLAINS.

	Feet.
Hibernia; point on east side, south abutment, near end of truss bridge over creek	250
Hibernia; nail in root of large maple at Four Corners	284.54
Washington Hollow, ¾ mile north of; point on flat rock west side of road, about 600 feet south of Howell's place; point chisel marked "U.S."	334.11
Washington Hollow; point on embedded rock near point of rock front of Wheeler's Hotel	330.50
Millbrook, 3 miles from; nail in root of butternut tree in grass triangle formed at Sharon road intersection	410.78
Millbrook, 2 miles west of; point in stone in south parapet wall of bridge over stream; point marked "U.S."	459.21
South Millbrook, ½ miles west of; point on rock north side of road, chisel marked "U.S."	544.61
South Millbrook, point on stone in edge of road northeast corner road intersection at; chisel marked "U.S. 544.7"	548.04
Millbrook; aluminum plate on west side Millbrook Bank near southwest corner of building, marked "ALBANY 568"	568.478
South Millbrook, point on rock brow of long hill east of; south side of road and chisel marked "U.S."	658.26
Little Rest, ½ mile west of; point on embedded bowlder near fence north side of road, about 300 feet west of John Sheehy's	743.47
Dover Plains, 4 miles from; point on rock road corner at Stillings Point, chisel marked "U.S."	909.51
Dover Plains, 3½ miles west of; nail in root of elm tree at road intersection in front of Haight's	843.06
Stone Church Brook; point on south side road about 20 feet west of bridge over point chiseled, marked "U.S. 804"	807.36
Dover Plains, 1¼ mile north of; nail, root of middle maple on north side of triangle at road crossing	466.99

	Feet.
Dover Plains; point of rock in triangle in front of schoolhouse, road intersection	410.77
Dover Plains, post at Ketchum's corner; top of	403.48
Dover Plains, nail in timber foundation of flag pole at Dover Plains hotel; chisel marked "U.S."	407.31
Dover Plains; tablet set in northwest corner of bank, marked "ALBANY 406"	406.255

DOVER PLAINS, VIA WASSAIC AND AMENIA ALONG HARLEM RAILROAD, TO MILLERTON.

Dover Plains, 4 miles from; stone under southwest corner of Smith's corncrib	435.25
Wassaic, 1 mile south of; point on end stone, third course from top east end, north abutment, bridge over highway, chisel marked "U.S."	435.37
Wassaic, ½ mile south of; corner of stone on buttress, face north abutment, bridge over Wassaic Creek	442.50
Wassaic, 600 feet south of; point west end, north abutment, bridge over stream	452.78
Amenia, mill pond; surface of water	534
Amenia station; point east end, south abutment, overhead bridge south of	552.4
Amenia, 1 mile north of; point on stone west edge railroad 300 feet south of road crossing	582.51
Amenia, aluminum tablet set in corner stone southwest corner Amenia Bank marked "ALBANY 573"	573.496
Sharon, point on rock west side railroad 360 feet north of; 86/45 milepost point marked with chisel "U.S."	577.20
Sharon station, ½ mile north of; point on stone west of railroad 300 feet north of 88/39 milepost	626.26
Coleman's, ¼ mile north of; point on second step from top west end, north abutment, overhead bridge No. 125	586.23
Amenia-Millerton-Pine Plains-Sharon road intersection, corner coping stone under girder west end, north abutment, bridge at	623.17
Millerton, ½ mile south of; point on east end, north abutment, bridge No. 30	680.15
Millerton, first bridge north of; point on second stone from top west end, south abutment	699.07

MILLERTON, VIA SHEKOMEKA ALONG NEWBURG, DUTCHESS AND CONNECTICUT RAILROAD, TO PINE PLAINS.

Millerton; aluminum tablet on northeast front of brick block hotel marked "ALBANY 701"	700.602
Millerton, point on second stone from top, south end, west abutment, bridge on Newburg, Dutchess and Connecticut Railroad at crossing	706.14
Millerton; point on cattle pass bridge No. 70, 800 feet west of railroad intersection	716.9
Millerton; point on cattle pass bridge No. 68, second step east end, south abutment	738.68
Winchell's station, 700 feet south of; point on rock north of track	949.46
Winchell's station, 1¼ miles west of; point east end, south abutment, cattle pass bridge No. 66	864.3
Shekomeka, 1 mile north of; point on fourth step from top, west end, south abutment, overhead bridge No. 63	731.43

	Feet.
Shekomeka, 1¾ miles west of; point on embedded stone west side of track; chisel marked "U.S." 100 feet west of bridge No. 61	572.88
Bethel station, point north end, west abutment, bridge No. 57, west of; chisel marked "U.S."	500.36
Bethel station, ½ mile west of; point lower step, south end, west abutment, cattle pass bridge No. 56	513.72
Pine Plains, ¼ mile east of; point on stone south side of track in rock cut 600 feet east of road crossing	488.93
Pine Plains; nail in root of elm tree north of track, east of road at station	469.50
Pine Plains; aluminum tablet set in stone foundation of Myer's dwelling, near southeast corner of house, marked "ALBANY 474"	474.198
Pine Plains, point west end, north abutment, culvert No. 55, 300 feet south of crossing ¾ mile south of	661.65

PINE PLAINS, VIA STISSING AND STANFORDVILLE, TO CLINTON CORNERS.

Pine Plains, road crossing 2¾ miles south of; point on second step, west end, south abutment, bridge No. 54, 200 feet north of road crossing	452.95
Attlebury station, point east side cattle pass, bridge No. 52, ½ mile south of station	443.7
Stissing station, ¼ mile north of; point on stone east of track	445.95
McIntyre, aluminum tablet set in face of south abutment, third course from ground Central New England bridge at; marked "ALBANY 399"	398.982
Stanfordville station, point on rock west side of track, 600 feet north of; chisel marked "U.S."	333.06
Stanfordville, ½ mile south of; point on stone east edge of track, 150 feet south of crossing	331.34
Stanfordville, 1 mile south of; point south end embedded timber trestle	320.7
Stanfordville, 1 mile south of; spike driven in base of telegraph pole, second east of trestle	323.07
Willow Brook; point on bowlder west side of road, north of railroad station, chisel marked "U.S."	353.97
Willow Brook, ¾ mile west of; point of rock north side of track, between two small rock cuts, point chisel marked "U.S."	372.18
Clinton Corners Crossing, point on top stone southwest corner west abutment, first bridge west of	300.17

POUGHKEEPSIE, VIA HIGHLAND ALONG WEST SHORE RAILROAD, TO NEWBURG.

Poughkeepsie; point on embedded stone in yard No. 95 Gardner street; Poughkeepsie and Eastern Railroad crossing, Gardner street	179.71
Poughkeepsie bridge; point on second course from top, north end, east abutment; chisel marked	180.30
Poughkeepsie bridge; point southwest corner top stone south end, west abutment; chisel marked	224.90
Highland; bolthead on northeast baseblock of bridge-bent, intersection Highland-Lewisburg roads	125.67
Highland; point top of stone east end north abutment of culvert just south of station	7.76
Highland, 1¾ miles south of; point on ledge opposite flagman's shanty	11.56
Milton, 1½ miles north of; point on top stone east end, north abutment, culvert; chisel marked	7.93
Milton Dock; tablet set in window sill south side Townsend's store marked "ALBANY 9"	8.581

	Feet.
Milton, ¾ mile south of; point on top stone east end, north abutment, second culvert, south side of Schermerhorn's shanty; point chisel marked "U. S."	7.04
Marlboro, ½ mile south of; point on foot stone east end, south abutment, bridge No. 96, point chisel marked "U. S."	5.76
Cedarcliff station; tablet set in face of rock 1,000 feet north of; marked "ALBANY 15"	14.608
Cedarcliff; point on second step from top east end, north abutment, north of station, chisel marked "U. S."	7.53
Cedarcliff, ¾ mile south of; point, second step from top, east end, north abutment, near Beacon Point	7.72
Roseton, 500 feet south of; point, step east end, north abutment, culvert; chisel marked "U. S."	7.74
Newburg, 1½ miles north of; point, top stone, east end, north abutment, culvert; chisel marked "U. S.;" front of Wright's engine works	13.80
Newburg; tablet set near southwest corner, to the right of entrance post-office building, marked "ALBANY 95"	95.100

NEWBURG, VIA ERIE RAILROAD, TO CORNWALL.

Newburg, 1 mile southwest of; projection, first course east end, south abutment, bridge seat; chisel marked	95.16
West Newburg; point, second step from top east end, north abutment, bridge at station	122.10
New Windsor; top embedded stone under tree 200 feet south of station and east of railroad	189.37
Vails Gate Junction, point on stone east of track and 100 feet south of; chisel marked	280.53
Cornwall, ¾ mile north of; point on stone edge of road crossing	249.6

CORNWALL, VIA NEWBURG JUNCTION ALONG ERIE RAILROAD, TO OXFORD.

Cornwall, 600 feet north of; tablet set in face of west abutment, New York, Ontario and Western Railroad bridge	272.269
Mountainville, 1 mile north of; top step, east end, north abutment of cattle pass	261.89
Mountainville, ½ mile north of; point on bridge seat near end of truss, west end, south abutment, railroad bridge	228.13

CORNWALL, VIA WOODBURY AND TURNERS ALONG ERIE RAILROAD, TO OXFORD.

Houghton Farm station; point on stone in east ditch 300 feet north of	296.31
Woodbury, 1 mile north of; point on bowlder, east ditch; old marked point	383.54
Woodbury, ¾ mile north of; point on stone in east side of track, 50 feet north of rock cut; chisel marked "U. S."	399.57
Woodbury; point on northeast foot block at end of truss bridge, 200 feet south of station	434.46
Woodbury, ¾ mile south of; stone in east ditch; chisel marked	462.79
Highland Mills; point on stone northeast corner bridge west of station	475.4
Central Valley; point on stone east end, south abutment, bridge seat, 200 feet north of station	482.76
Central Valley, 1,000 feet south of; stone in west ditch along railroad	490.59
Central Valley; tablet set in large stone in retaining wall front of Finken's place, first west of Noxon's store, marked "ALBANY 488"	487.889
Central Valley, 2 miles south of; stone west of track, 200 feet south of farm crossing	521.60

	Feet.
Newburg Junction, ¼ mile north of; point on bridge seat, east end, south abutment railroad bridge	516.79
Arden; Echo Lake, surface of water	707
Arden, 300 feet north of; point on top east end, north abutment, bridge over stream; chisel marked	520.72
Arden; tablet set in pier top east end railroad bridge over stream, 300 feet north of station, marked "ALBANY 519"	519.250
Arden, 1½ miles east of; stone north side of road on hill; chisel marked "U. S."	799.82
Arden, 4.7 miles east of; stone 250 feet north of barn and west of road	913
Doyle's, ¼ mile east of; tablet set in road face of large bowlder marked "ALBANY 718"	718.476
Turner's, 300 feet west of; point on north end, west abutment, bridge; chisel marked "U. S."	553.34
Turner's, 1½ miles west of; point north end, east abutment, culvert	562.21
Monroe, ½ mile east of; point top north end west abutment of culvert	590.87
Monroe; south end Carpenter's feed store doorstep	607.94
Oxford, 300 feet east of; point, north end, east abutment, overhead bridge	530.5
Oxford, point on rock at edge of path to spring, ¼ mile west of; chisel marked "U. S."	513.83

OXFORD, VIA BURNSIDE, TO CORNWALL.

Greycourt, 1,200 feet east of; point north end, east abutment, culvert; chisel marked	433.96
Greycourt; tablet set in face of north abutment, Lehigh and Hudson River Railway bridge over road, marked "ALBANY 447"	446.824
Greycourt; point northwest corner south pier, under second bent from south end, Lehigh and Hudson River Railway bridge at; marked with old "X"	436.78
Greycourt; point bridge seat east end, north abutment, Lehigh and Hudson River Railway bridge over Erie Railroad	448.58
Craigville, 300 feet north of; point second step from top, south abutment, east end, cattle pass	421.97
Farmingdale, 500 feet north of; point top south abutment, east end, cattle pass	377.82
Farmingdale, ½ mile north of; point top south abutment, west end, cattle pass	390.28
Hamptonburg, ½ mile south of; point top, east end, south abutment, cattle pass	400.36
Hamptonburg, point ¾ mile north of; on west end, north abutment, cattle pass	399.6
Elesmere, ½ mile south of; point second step from top, west end, north abutment, cattle pass	371.36
Burnside, ⅓ mile south of; point second step, east end, north abutment, railroad bridge over swamp on Lehigh and Hudson River Railway	348.14
Burnside, 1¼ miles east of; tablet east face of road bridge abutment, marked "ALBANY 357"	357.391
Burnside, ¼ mile east of; point north end, east abutment, road bridge	370.8
Little Britain, 1 mile west of; point stone north side track, 20 feet east 62-mile post	449.09
Little Britain, 600 feet east of; point south end, east abutment, cattle pass.	437.4
Meadowbrook, 1½ miles west of; point south end, west abutment, top course bridge over road	405.81

	Feet.
Meadowbrook, 400 feet east of; point north end, east abutment, culvert	335.8
Cornwall, ⅔ mile east of; point on coping west end, south abutment, Erie Railroad bridge	336.89
Cornwall; point on step north end, west abutment, bridge New York, Ontario and Western Railroad	270.38

MADISON COUNTY.

CHITTENANGO, CAZENOVIA, MORRISVILLE, AND ONEIDA QUADRANGLES.

The elevations published in the following list are based on bench mark No. 51, established in the course of the precise leveling of the United States Engineers on a bridge abutment about 1 mile east of Higginsville. The height of this bench mark, as reduced to mean sea level in accordance with the latest data (see Appendix to Nineteenth Annual Report, page 203), is accepted as 430.320 feet above mean sea level.

The leveling was executed under the direction of Mr. A. M. Walker, topographer, by Messrs. W. W. Gilbert and A. W. Gill, levelmen.

All bench marks dependent on this datum are marked with the letters "ALBANY," in addition to their figures of elevation.

CANASTOTA, VIA PERRYVILLE, FENNER, PETERBORO, MORRISVILLE, AND ROME, WATERTOWN AND OGDENSBURG RAILROAD, TO HIGGINSVILLE AND HAPPY VALLEY.

	Feet.
Canastota, Peterboro street bridge over Erie Canal, towpath abutment, east wing, fourth step, canal bench mark No. 52	433.963
Canastota, about ½ mile south of New York Central and Hudson River Railroad station, iron bolt set in coping culvert (Lehigh Valley Railroad bench mark 118)	457.447
Clockville, 400 feet south of; 15 feet east of track, waterpipe valve case south edge of bell (Lehigh Valley Railroad bench mark 116)	645.80
Cotton station, Lehigh Valley Railroad bench mark, 114 inches, $\frac{4}{10}$ mile southwest of culvert, for farm crossing on north side of track, iron bolt in coping	757.993
Perryville, 1½ miles northeast of; overhead highway crossing north abutment, west face, corner railroad, spike driven into joint of masonry	907.738
Perryville, crossroads, new schoolhouse on site of old church, corner to right of front entrance, tablet set in stone foundation, marked "1103 ALBANY"	1,103.344
Perryville, 1 mile southeast of; fork of road, bowlder in fork, 10 feet from end of sluice, marked with chisel	1,270.44
Perryville, 1⅔ miles southeast of; crossroads northwest corner, coping of sluice, marked with chisel	1,406.98
Fenner, schoolhouse, lower stone step, northwest corner, marked with chisel	1,546.53
Fenner, 1 mile south of and 1,000 feet north of Peterboro turnpike, 150 feet south of orchard, 75 feet west of road, in outcrop, copper bolt marked "1466 S."	1,467.331
Peterboro, 4 miles west of; crossroads, schoolhouse near southeast corner, 5 feet from road opposite south end of schoolhouse, bowlder marked with chisel	1,639.58

	Feet.
Peterboro; 2.2 miles northwest of; road to right opposite schoolhouse southwest corner, bowlder 3 feet from fence corner, chisel marked	1453.26
Peterboro; schoolhouse south side 15 feet from rear corner, tablet set in stone foundation, marked "1320 ALBANY"	1320.913
Peterboro; 2 miles south of crossroads, southwest corner, maple tree 2½ feet diameter, point notch on root	1304.15
Morrisville, ½ mile west of; fork of road, 50 feet south of elm tree 1¼ feet diameter by east road fence, post notch on root	1288.35
Morrisville; county jail, front, 7 feet from west corner to tablet set in stone foundation marked "1325 ALBANY"	1326.00
Morrisville station, 0.6 mile west of; chisel mark on bowlder south side of road 30 feet west of driveway of white house on south side	1436.52
Morrisville station, north line of; top of rail	1225.61
Pine Woods, 600 feet west of railroad crossing on Morrisville road. Nail in root north side of large elm tree in fence south side of road	1153.02
Whites Corners, ⅜ mile north of; 15 feet west of crossing, nail in top of stump of telegraph pole	1153.58
Pratts station, ¼ mile north of; nail in top of 254th milepost	1111.41
Pratts station, 1¼ miles north of; nail in top of 255th milepost	1048.02
Munnsville station, 2 miles south of; nail in top of 256th milepost	988.27
Munnsville station, 1 mile south of; nail in top of 257th milepost	926.86
Munnsville station, ⅛ mile south of; nail in top of 258th milepost	869.29
Munnsville; aluminum tablet set in stone foundation south side 15 feet east of southwest corner of Dexter & Davis' building used by them as store and post-office, marked "679 ALBANY"	679.261
Stockbridge station, ¼ mile north of; nail in top of 259th milepost	804.1
Valley Mills station, ½ mile south of; nail in top of 260th milepost	741.03
Valley Mills station, 1½ miles north of; nail in top of 262d milepost	610.89
Kenwood, ¾ mile south of; nail in top of 263d milepost	547.04
Kenwood, ¼ mile north of; nail in top of 264th milepost	492.29
Oneida Castle, 1 mile south of; nail in top of 265th milepost	458.03
Oneida Castle, 1 mile south of; nail in top of 266th milepost	445.36
Oneida station, ⅜ mile south of; nail in top of 267th milepost	426.69
Oneida; at New York Central & Hudson River Railroad; chisel mark on step at back of third course of stone, north end of west abutment of New York Central and Hudson River Railroad bridge over New York, Ontario and Western	422.01
Durhamville, ½ mile south of station; nail in top of 269th milepost	431.57
Durhamville, west road bridge canal (iron bridge) copper bolt in southeast corner of third step, east wing of towpath abutment	431.925
Durhamville; east road bridge over canal; copper bolt in southwest corner of third step, west wing of towpath abutment	433.043
Durhamville, ½ mile north of station; nail in top of 270th milepost	430.25
State bridge; road bridge over canal; copper bolt southeast corner of second step, east wing of towpath abutment	431.903
State bridge, ⅝ mile east of; road bridge over canal; copper bolt southeast corner of second step, east wing of towpath abutment	431.816
Higginsville; west road bridge; on southwest corner of third step, west wing of towpath abutment	432.54
Higginsville; east road bridge over canal; copper bolt southeast corner of third step, east wing new towpath abutment	432.554
Happy Valley; 1 mile east of (or below) Higginsville; chisel mark on projection second course of stone in face of north abutment of road bridge over canal (U.S. Engineer's, B.M.) marked "B.M." on stone	432.10

	Feet.
Happy Valley; same bridge and abutment; on projection east wing, first course near angle, chisel mark "B.M." (U.S.Engineer's B.M.)	430.320
Happy Valley; same bridge and abutment; on projection third course, east wing fourth stone from end, marked "B.M." on stone. (Canal B.M.)	433.175

MORRISVILLE, VIA WEST EATON, GEORGETOWN, EARLVILLE, AND HAMILTON, TO MORRISVILLE STATION.

Eagleville, 1½ miles south of Morrisville, fork of road 75 feet south of bridge, elm tree 2½ feet diameter in fork, point notch on root	1,264.86

EAGLEVILLE ALONG PUBLIC ROAD, VIA WEST EATON TO GEORGETOWN STATION, THENCE VIA RAILROAD, TO BENCH MARK PLACED IN 1897, ABOUT 2½ MILES SOUTH OF ERIEVILLE.

West Eaton; schoolhouse, front, right of entrance, 1 foot from corner; tablet set in stone foundation, marked "1395 ALBANY"	1,395.443
West Eaton, 2 miles southwest of; Hatch's pond, west side of, 200 feet north of farmhouse, pine tree 2½ feet diameter between road and pond, point notch on root	1,481.91
Georgetown, railroad station 600 feet north of elm tree, 3 feet diameter, by west road fence, point notch on root	1,444.96
Georgetown, railroad station 1¾ miles northwest of; 1,200 feet north of road crossing 5-foot cattle pass, northwest wing, 3 feet below track, marked on corner of step	1,583.31
Georgetown station, 1¾ miles southeast of; 10-foot span bridge, stream right east abutment, north end, iron bolt in abutment, 2½ feet below top of tier	1,493.75
Lebanon, 1 mile west of; railroad bridge over highway, west abutment, south wing, bottom step, face corner	1,393.95
Lebanon; store 50 feet north of station east of street; tablet set in foundation wall near southwest corner, marked "1346 ALBANY"	1,345.827
Earlville, 3 miles northwest of; bridge stream, left, 50 feet northeast of birch tree 2 feet diameter, point notch on root	1,229.69
Earlville, 2½ miles northwest of; bridge, stream left, west abutment north wing, face corner, top step, marked with chisel	1,211.60
Earlville, ½ mile north of station; plate-girder bridge, New York, Ontario and Western Railroad, south abutment, east girder, outside anchor bolt, top	1,086.79
Earlville; tablet set in brickwork of schoolhouse, 1 foot to right of front door, marked "1100 ALBANY"	1,100.122
Earlville, ¾ mile north of; top of anchor bolt, northwest shoe of railroad bridge over stream	1,087.05
Randallsville, 1¼ miles south of; nail in top of north post of extra rail support at 243d milepost	1,105.12
Randallsville; at water tank; nail in top of sill under south side of water tank; nail in east end of sill	1,110.69
Randallsville, ¾ mile north of; nail in top of south post extra rail support at 245th milepost	1,114.64
Hamilton, ½ mile south of; nail on top of south post; extra rail support at 246th mile post	1,107.49
Hamilton; south side of Lebanon street, 300 feet east of railroad; top of fire hydrant	1,113.557
Hamilton Bank building; aluminum tablet in water table at northeast corner of bank building, 2 feet west of corner, marked "1126 ALBANY"	1,125.843

	Feet.
Hamilton, 1 mile north of; chisel mark on top northwest corner top course east abutment of railroad bridge over old canal	1, 126. 91
Pecksport, ⅝ mile south of; nail in top of south post of extra rail support at 249th milepost	1, 146. 30
Pecksport, ⅜ mile north of; nail in top of south post extra rail support at 250th milepost	1, 145. 06
Bouckville; aluminum tablet in wall of stone building occupied by Coe & Brockett's store, in north side of building 2 feet above ground and 1 foot west of northeast corner, marked "1149 ALBANY"	1, 149. 414
Bouckville, ⅞ mile west of, ⅛ mile west of first road to north; chisel mark on westernmost of two large bowlders on north side of road	1, 207. 47

MONROE, WAYNE, ONTARIO, YATES, SCHUYLER, STEUBEN, CHEMUNG, TOMPKINS, AND SENECA COUNTIES.

MACEDON, PALMYRA, CANANDAIGUA, PHELPS, PENN YAN, HAMMONDSPORT, BATH, CORNING, CLYDE, GENEVA, OVID, WATKINS, ELMIRA, GENOA, AND ITHACA QUADRANGLES.

The elevations published in the following list are based on an aluminum tablet set in the post-office building in Oswego and marked "295 Oswego." (See page 331, Appendix to Twentieth Annual Report.) The elevation of this bench mark, as therein given, is accepted as 294.738 feet above mean sea level.

The leveling of this season was done, under the direction of Mr. J. H. Jennings, topographer, by Messrs. C. H. Semper and W. F. Hammond, levelmen.

All bench marks dependent upon this datum are marked with the letters "OSWEGO" in addition to their figures of elevation.

NEWARK, SOUTH ALONG NORTHERN CENTRAL RAILWAY, TO PHELPS JUNCTION.

	Feet.
Newark; chisel mark on bowlder at southeast end of railroad cut 1,500 feet south of Asylum road crossing	456. 48
Newark, 4.5 miles south of; on large rock 15 feet east of railroad on farm crossing; chisel marked	540. 71
Newark, 6 miles south of; on rock on northeast side of railroad crossing 15 feet east of rail, 2 feet south of fence; chisel marked	546. 04
Phelps Junction; east corner of stone step of flagman's house on north side of railroad; chisel marked	570. 25
Phelps Junction, 1.2 miles east of; on east end of stone abutment of aqueduct on south side of track, 15 feet from east end of wall; chisel marked "U.S.G.S. B.M. 536"	535. 94
Phelps; aluminum tablet set in southwest corner of schoolhouse on corner of Main and Banta streets, marked "542 OSWEGO 1899"	542. 362
Phelps, 5 miles east of; top of iron bolt at east end of railroad bridge in wooden guard rail on south side of track; chisel marked "B.M. U.S.G.S. 516"	506. 11
Phelps, 2 miles south of; top of rock on east side of railroad, 20 feet north of ringing post 1,500 feet south of crossroad; chisel marked "U.S.G.S. 485"	485. 28
Oaks Corners, 1.5 miles south of; on top of third bolt in railroad-crossing sign on north side of highway, west side of railroad	483. 86
East X; on southwest corner of stone step of station house on Lyons and Geneva Railroad; chisel marked	477. 74

	Feet.
East X, 1.7 miles north of; top of lower nut on west side of railroad-crossing sign; marked red	490.56
East X, 2.9 miles north of; top of bolt at northwest end of small bridge, on top of guard rail, marked "490"	489.81

PHELPS JUNCTION TO FAIRPORT, ALONG NEW YORK CENTRAL AND HUDSON RIVER RAILROAD.

Phelps Junction, 1.2 miles west of; top of stone abutment of creek, on south side of railroad; marked with chisel "U.S.G.S. B.M. 563"	564.62
Clifton Springs; top of south abutment of small creek bridge 800 feet east of station; chisel marked "U.S.G.S. B.M. 567"	567.14
Clifton Springs, 1.2 miles west of; top of bridge abutment over stream; chisel marked "U.S.G.S. B.M. 572"	571.70
Clifton Springs, 3 miles west of; top of abutment of small creek bridge south side of railroad; chisel marked "U.S.G.S. B.M. 602"	602.42
Clifton Springs, 3.9 miles west of; bronze tablet set in Lehigh Valley overhead bridge abutment over Auburn Branch of New York Central and Hudson River Railroad, north abutment; marked "611 OSWEGO 1899"	611.120
Manchester, top of bolt in top west abutment of railway bridge Lehigh Valley Railway, B.M. No. 359	606.52
Manchester, 1.5 miles west of; chisel mark on rock south side of track, 800 feet west of crossing	600.77
Farmington, 2.2 miles east of; chisel mark on south end of open culvert	591.12
Farmington, bronze tablet set in top of large bowlder 500 feet south of station marked "599 OSWEGO 1899"	598.646
Victor, 2 miles east of; top of iron post set at end of curve, 600 feet west of crossing	575.01
Victor, 1,500 feet east of; bronze tablet set in south end of east abutment of railway, cattle pass, marked "559 OSWEGO 1899"	559.129
Valentine Hall, top of horse block at schoolhouse, 800 feet west of	718.93
Valentine Hall, 2 miles northwest of; top of bowlder at east side of road, 1 mile southeast of basin	569.43
Fairport, 3 miles west of; chisel mark top of towpath wall of stop gate, Erie Canal	463.62
Fairport; in water table front of Union School; on Church street aluminum tablet, marked "498 OSWEGO"	498.029

PHELPS JUNCTION, VIA STANLEY, TO PENN YAN, ALONG THE NORTHERN CENTRAL RAILWAY.

Orleans; top of bolt on southeast of overhead bridge in guard rail first road north of station, marked "U.S.G.S. B.M. 718"	717.93
Seneca Castle; top of abutment on stone sluice on southwest side 10 feet west of railroad, in highway, at station, marked "U.S.G.S. B.M. 784"	783.59
Seneca Castle, 1.8 miles south of; top of wall of cattle pass, south abutment, west side, marked with chisel "U.S.G.S. B.M. 812"	811.91
Flint, top of west wing, north abutment of river bridge 1,000 feet north of; marked with chisel "U.S.G.S. B.M. 821"	820.65
Stanley; aluminum tablet set in northwest corner of grain elevator at railroad station, marked "903 OSWEGO 1899"	903.08
Stanley, 0.9 mile south of; top of large rock in farm lane 35 feet west of railroad by cattle pass, marked with chisel "U.S.G.S. B.M. 908"	908.23
Hall, 0.7 mile south of; top of iron bolt in guard rail of cattle pass, southeast end, marked with chisel "U.S.G.S. B.M. 877"	876.65

	Feet.
Hall, 2.6 miles south of; top of north abutment west side of bridge over small stream at pumping station, marked with chisel "U.S.G.S. B.M. 853"	853.24
Bellona; top of rock on east side of railroad 25 feet north of switch at north end of yard, marked "U.S.G.S. B.M. 862"	861.89
Bellona; aluminum tablet set in southeast corner of Memorial Presbyterian Church on Main street, marked "731 OSWEGO 1899"	731.287
Bellona, 0.2 mile south of; on northwest corner of wall of culvert, marked with chisel "U.S.G.S. B.M. 853"	852.86
Bellona, 1.2 miles south of; top of rock 20 feet from railroad at farm crossing, marked with chisel "U.S.G.S. B.M. 846"	846.09
Benton; tablet set in northeast corner of Methodist church, marked "1089 OSWEGO 1899"	1,088.904
Benton, 1.4 miles south of; on northwest corner of wall to small bridge, marked "U.S.G.S. B.M. 818"	818.30
Benton, 2.2 miles south of; top of wall northwest wing of highway bridge 50 feet east of railroad at crossing, marked "U.S.G.S. B.M. 805"	804.76

PENN YAN TO HIMRODS.

Penn Yan, top of hydrant in front of saloon, second north of street in front of Knapp Hotel	737.07
Penn Yan; aluminum tablet set in front face of Penn Yan Academy, marked "767 OSWEGO 1899"	767.614
Penn Yan; Keuka Lake, surface of water	709
Penn Yan; top of east wing of north abutment of overhead road bridge, 1,000 feet south of station, marked "U.S.G.S. B.M. 757"	757.00
Penn Yan, 2.4 miles south of; top of rock on west side of railroad on highway margin, marked with chisel "U.S.G.S. B.M. 831"	831.56
Milo; top of rock 40 feet west of railroad at first road south of station, marked with chisel "U.S.G.S. B.M. 853"	853.48
Milo; top of rock on south side of road in front of hotel barn, marked with chisel "U.S.G.S. B.M. 929"	928.96
Milo Center; tablet set in east side of church on Main street, marked "947 OSWEGO 1899"	946.949
Milo, 1.6 miles south of; top of southeast end of creek abutment, marked with chisel "U.S.G.S. B.M. 845"	845.66
Himrods; top of south abutment of west wing of bridge over stream 500 feet north of station, marked with chisel "U.S.G.S. B.M. 798"	798.25

HIMRODS TO 4½ MILES WEST OF, ALONG HIGHWAY.

Himrods, 1.9 miles west of; chisel mark on top of bowlder at side of road	1,191.38
Himrods, 3¼ miles southwest of; chisel mark on bowlder on east side of road, 50 feet south of road leading east	1,255.97
Himrods, 4½ miles southwest of; tablet set in face of east wing, north abutment, of small bridge ¾ mile south of forks in road, marked "1111 OSWEGO 1899"	1,111.644

HIMRODS, VIA FALL BROOK RAILWAY, TO READING CENTER.

Himrods, 500 feet north of; chisel mark on west end south abutment of bridge on Northern Central Railway	798.25
Himrods, ⅓ mile south of; chisel mark on southeast corner of cattle pass marked "917"	916.82
Dundee, 2 miles north of; chisel mark on large bowlder northwest side of track	995.44

	Feet.
Dundee, chisel mark on foundation of railway water tank	988.70
Dundee, 1¼ miles south of; chisel mark on east end north abutment of trestle over big stream	967.41
Dundee, 1½ miles south of; chisel mark on second trestle north abutment.	984.01
Rock Stream, ½ mile north of; chisel mark on east end south abutment of Rock Stream bridge	1,036.53
Reading Center, 2 miles north of; chisel mark on bridge seat of cattle pass ¾ mile south of Rock Stream	1,045.11

STANLEY TO CANANDAIGUA LAKE.

Stanley, 1.9 miles west of; top of rock on north side of railroad 100 feet west of snow fence, marked with chisel "U.S.G.S. B.M. 909"	909.48
Gorham, top of girder of iron bridge north side east end 100 feet west of station, marked with chisel "U.S.G.S. B.M. 895"	894.96
Gorham, 0.8 mile west of; top of rock on north side of railroad by farm gate, marked with chisel "U.S.G.S. B.M. 923"	923.26
Greenes, 0.4 mile west of; top of bolt in trestle over small stream north side east end, marked with chisel "U.S.G.S. B.M. 959"	959.35
Greenes, 2.3 miles west of; top of bolt in rail of trestle over small stream north side west end, marked "U.S.G.S. B.M. 882"	881.72
Rushville, first road east of station, top of highway bridge rail 50 feet south of railroad west side, south end, marked with chisel "U.S.G.S. B.M. 868"	867.50
Rushville; tablet set in water table northeast corner of Methodist Episcopal church, marked "870 OSWEGO 1899"	870.047
Rushville, 1¾ miles south of; chisel mark on large bowlder at east side of road	1,111.40
Canandaigua Lake, surface of water	685.00

POTTER CENTER, VIA URBANA, TO HAMMONDSPORT.

Potter Center, 1½ miles north of; chisel mark on large bowlder 70 feet south of forks in road, at east side of road	1,221.26
Potter Center, ¾ mile northwest of; chisel mark on rock at bend in road at side of road	1,073.28
Potter Center, tablet set in east end of north abutment of iron bridge over Flint Creek, marked "893 OSWEGO 1899"	892.512
Potter Center, 1 mile south of; chisel mark on top of bowlder at northwest corner of crossroads	1,034.34
Friend; chisel mark on west abutment, north end of bridge, at	986.91
Branchport, 4 miles north of; chisel mark on bowlder 100 feet south of road and 400 feet southwest of large old house	1,018.55
Branchport, 3½ miles north of; chisel mark top of bowlder west side of road, 600 feet south of fork in road	853.20
Branchport, 2½ miles north of; chisel mark top of bowlder on wing wall southeast corner of small bridge	780.79
Branchport, ¾ mile north of; chisel mark on top covering stone east end of sluice	764.85
Branchport, 1,200 feet east of; tablet set in south end, west abutment, of highway bridge road to Penn Yan, marked "720 OSWEGO 1899"	719.776
Branchport, 1⅒ miles south of; chisel mark on east end of culvert 700 feet south of forks in road	730.87
Gibsons, 3 miles north of; aluminum tablet set in west end north wall of iron bridge, marked "733 OSWEGO 1899"	732.726
Urbanna, tablet set in east side of wine cellar, marked "734 OSWEGO 1899"	733.604

	Feet.
Hammondsport, 2.1 miles north of; chisel mark on rock on west side of road, "765 B. M." marked on railing	765.08
Hammondsport, chisel mark on covering stone of drain at north end of L. R. McCorn's wine cellar, 300 feet north of railway station	740.02
Hammondsport, ¼ mile south of; tablet set in west end, north abutment of bridge over inlet, marked "718 OSWEGO 1899"	717.807

HAMMONDSPORT, VIA BATH, TO SAVONA.

Pleasant Valley, ½ mile west of; chisel mark on north end of pier of open bridge	819.74
Hermitage, 0.3 mile west of; top iron railing southwest corner of highway bridge	957.34
Court-house, 0.3 mile west of; chisel mark on northeast corner of cattle pass	1,123.12
Bath; tablet set in water table county clerk's office at left of entrance, marked "1103 OSWEGO 1899"	1,102.605
Bath, 2¼ miles south of; chisel mark on east end of arch culvert under Delaware, Lackawanna and Western Railway	1,082.39
Bath, 3.5 miles south of; chisel mark on west end of parapet wall north abutment	1,074.26
Savona; tablet set in south end east abutment of highway bridge over Cohocton River, marked "1050 OSWEGO 1899"	1,049.921

SAVONA, VIA BRADFORD AND TYRONE, TO READING CENTER.

Savona, 1.75 miles north of; chisel mark on large bowlder at side of road	1,141.04
Savona, 0.5 mile north of; iron support to northwest corner of iron bridge	1,085.01
Bradford, 2 miles south of; chisel mark on bowlder 50 feet south of road leading east	1,228.57
Bradford, 1 mile south of; chisel mark on bowlder at four corners	1,128.39
Bradford; tablet set in top of south abutment west end, marked "1100 OSWEGO 1899"	1,099.652
Tyrone, 2.5 miles south of; chisel mark on bowlder at west side of road at small house	1,224.76
Tyrone, 2 miles south of; chisel mark on bowlder 200 feet south of road to east	1,204.45
Tyrone; top of top chord west side of bridge at gristmill	1,160.84
Tyrone; bronze tablet set in west end of south wall of highway bridge at gristmill, marked "1150 OSWEGO 1899"	1,154.431
Tyrone; top of bowlder at corner of Lamoska Hotel	1,236.31
Tyrone; top of bowlder, 200 feet east of bridge	1,200.36
Tyrone, 1 mile east of; chisel mark on large bowlder 100 feet south of road to Altay	1,358.91
Tyrone, 1.5 miles east of; chisel mark on bowlder at road leading south to Monterey	1,477.14
Tyrone, 2 miles south of; chisel mark on large bowlder at west of road 1,200 feet north of crossroads	1,528.94
Tyrone, 3 miles southeast of; corner stone at crossroads	1,619.63
Monterey, 3.4 miles north of; top of bowlder at west side of road	1,517.16
Monterey, 3 miles north of; top of bowlder, 50 feet west of road	1,434.87
Monterey, 1 mile north of; top of iron support to bridge, southeast corner of bridge	1,256.72
Monterey; bronze tablet set in bowlder 60 feet northwest of iron bridge, marked "1212 OSWEGO 1899"	1,211.997

	Feet.
Altay, 1 mile southwest of; chisel mark top of bowlder, at west side of road	1,281.69
Altay, 1,000 feet west of; bronze tablet set in top of north wing east abutment of highway bridge, marked "1213 OSWEGO 1899"	1,212.877
North Reading, ½ mile north of; top of bowlder at road corner	1,285.58

SAVONA, VIA ERIE RAILWAY, TO PAINTED POST.

Savona, 0.45 mile south of; chisel mark on east end of pier	1,044.21
Savona, 1.8 miles south of; top of bowlder on east side of track 1,200 feet north of crossing	1,035.84
Campbells, 700 feet north of station; chisel mark on east end of bridge seat south wall of railroad girder bridge	1,006.45
Coopers, 1 mile south of; chisel mark on east end of bridge seat south wall	950.07
Painted Post, 2 miles north of; crossing of Delaware, Lackawanna and Western and Erie railways, top of rail	948.40
Painted Post, 1 mile north of; chisel mark on west end of parapet wall, north abutment	942.12
Painted Post, 0.8 mile west of; bronze tablet set in southeast corner of open bridge on precise line marked "935 DUNKINK 1898"	935.400

COOPERS, VIA EAST CAMPBELL, TO MONTEREY.

Coopers, 1 mile north of; mark (x) on anchor bolt southwest corner of iron bridge	979.83
Monterey, 3 miles south of; top of bowlder at road to South Bradford	1,126.72
Monterey, 1½ miles south of; bench mark top iron support of iron bridge southwest corner	1,176.90

NORTH ROSE, VIA LYONS, TO GENEVA.

North Rose, 0.5 mile east of; chisel square on south end of west abutment of open culvert over small stream	379.47
Shears Corners; top of large rock in fence on west side of road, 100 feet north of crossroads at farm gate, chisel marked "U.S.G.S. B.M. 416"	415.82
Wayne Center, 3.3 miles north of; top of large rock in stone fence on north side of road, 100 feet north of Frank Phillips's green barn, chisel marked "U.S.G.S. B.M. 406"	406.58
Wayne Center, 1.6 miles north of; on large rock in center of road to, east to Shears Corners, chisel marked "U.S.G.S. B.M. 424"	424.042
Wayne Center; tablet bench mark set in southeast corner of schoolhouse on crossroads, marked "438 OSWEGO 1899"	437.952
Lyons, 4.9 miles north of; top of rock on west side of road by large pile of cobbles, 300 feet south of house, chisel marked "B.M. 477"	477.12
Lyons, 4 miles north of; top of rock on east side of road, 50 feet north of three corners, on line of fence, chisel marked "U.S.G.S. B.M. 414"	414.10
Lyons, 2.6 miles north of; top of rock on west end of small bridge at four corners, chisel marked "U.S.G.S. B.M. 404"	404.08
Lyons; top of stone post at southwest corner of Jackson and Canal streets, chisel marked "B.M. 406"	406.14
Lyons; tablet in Dutch Reform Church, on west side of Broad street, between Church and Pearl streets, marked "OSWEGO 437 1899"	437.434
Thompson's, 2 miles north of; top of rail on north side of track, in wooden sluice 200 feet west of hand-car house, 6 feet north of rail, chisel marked "B.M. 403"	403.11

	Feet.
Thompson's, 0.9 mile north of; top of south end of west abutment of Creager highway bridge, chisel marked "B.M. 400"	399.81
Thompson's; top of spike on switch stand in front of station, most westerly spike, chisel marked "B.M. 404"	403.92
Cuddeback, 0.8 mile north of; on northwest corner of stone foundation of wooden bent, under overhead bridge, on east side of railroad, chisel marked "B.M. 451"	451.53
Cuddeback, 0.1 mile north of; top of bolt in wooden guard rail over culvert on west side of track, north end of rail; marked "B.M. 478"	477.96
Mitchells; tablet in north face wall of post-office at railroad crossing, Junius post-office, marked "491 OSWEGO 1899"	491.614
East X, 1.3 miles south of; top of coping stone on west parapet wall at small creek in highway to Geneva, chisel marked "U.S.G.S. B.M. 459"	459.62
Geneva; top of water plug on north side of railroad on Exchange street, at southwest corner of Vance Boiler Works	458.80
Seneca Lake, surface of water	444.0

GENEVA, VIA KENDAIA, TO OVID.

Geneva; tablet set in water table, west face of St. Peter's Church, marked "481 OSWEGO 1899"	480.654
Geneva, 1.9 miles south of; top of copper bolt set in west end of south abutment of road bridge No. 342, L.V., marked "U.S.G.S. B.M. 465"	464.67
Geneva, 2.7 miles south of; top of east end of south abutment of small iron bridge, marked with chisel "U.S.G.S. B.M. 467"	466.90
Geneva, 6.3 miles south of; top of iron bolt set in top step west end of south abutment of Lake road overhead bridge, marked "U.S.G.S. B.M. 522," No. 337, L.V	522.28
Varick, 0.5 mile south of; top of iron pin in culvert masonry on west side of arch, L.V., No. 236, marked "U.S.G.S. B.M. 547"	547.14
Varick, 1.8 miles south of; tablet set in northeast foundation stone of Lehigh Valley Railroad water tank, on west side of railroad, marked "562 OSWEGO 1899"	562.605
Varick, 4.2 miles south of; top of coping stone of railroad culvert on west side of track, marked with chisel "U.S.G.S. B.M. 604"	604.36
Kendaia; tablet set in northwest corner of foundation wall of grain elevator, 40 feet east of railroad on highway, marked "614 OSWEGO 1899"	614.106
Kendaia, 0.7 mile south of; top of iron pin set in rock on crossroads, 10 feet west of railroad, 200 feet west of school, marked "U.S.G.S. B.M. 631"	631.22
Kendaia, 2.2 miles south of; top of iron bolt set in south wall west side of cattle pass at railroad crossing No. 329, L.V., marked "U.S.G.S. B.M. 648"	647.74
Kendaia, 3.5 miles south of; top of iron bolt in masonry road culvert, 30 feet east of railroad at crossing, marked "U.S.G.S. B.M. 671," No. 328, L.V	671.01
Ovid, spike in switch stand north to; marked "702" on fence	702.58

WILLARD, ALONG WILLARD RAILROAD, TO HAYTS CORNERS.

Asylum, 0.5 mile east of; top of rock on north side of railroad, marked with chisel "U.S.G.S. B.M. 757"	757.30

WILLARD TO WATKINS.

	Feet.
Willard; top of iron bolt in masonry on west side of railroad in first highway south of station, marked "U.S.G.S. B.M. 708," No. 326, L.V	708.39
Willard, 0.8 mile south of; top of iron bolt set in top stone of cattle pass, northwest side of railroad, No. 326, L. V., marked "U.S.G.S. B.M. 721"	721.46
Willard, 3.2 miles south of; top of iron bolt set in masonry of overhead bridge on northwest side, No. 323, L. V., marked "U.S.G.S. B.M. 773".	773.48
Lodi, 0.8 mile south of; top of iron pin set in step of overhead farm bridge on northwest wing, No. 322, L. V., marked "U.S.G.S. B.M. 800"	800.55
Lodi, 1.9 miles south of; top of iron bolt set in top of masonry of creek bridge on east side of railroad, No. 321, L. V., marked "U.S.G.S. B.M. 817"	817.07
Lodi, 2.9 miles south of; top of iron pin in top of wall of cattle pass on northeast side of railroad, No. 320, L. V., marked "U.S.G.S. B.M. 829".	829.17
Caywood, 0.2 mile south of; top of iron bolt set in top stone of culvert masonry on southeast side, No. 319, L. V., marked "U.S.G.S. B.M. 839"	838.73
North Hector; tablet set in masonry of basket factory, on crossroads, ½ mile south of station, 0.2 mile west of railroad, marked "840 OSWEGO, 1899"	840.009
Hector, 0.3 mile south of; top of iron pin in northeast side of cattle pass No. 314, L. V., marked "U.S.G.S. B.M. 926"	926.11
Hector, 1.3 miles south of; top of copper bolt in west end of south abutment of bridge over small stream, bolt marked "U.S.G.S. B.M. 939".	939.852

WOLCOTT, ALONG HIGHWAY AND RAILROAD, TO SENECA FALLS.

Wolcott; northwest corner of Main and Clyde streets, in masonry foundation southeast corner of Baptist church, aluminum tablet marked "378 OSWEGO"	378.016
Wolcott, 0.6 mile south of; top of rock on east side of road to South Butler, 10 feet from fence, chisel marked "U.S.G.S. B.M. 417."	416.69
Wolcott; 2.2 miles south of; top of large rock on east side of road 5 feet from fence, 250 feet north of white house, chisel marked "U.S.G.S. B.M. 413	413.0
Wolcott, 4.2 miles south of; top of large rock on east side of road, 200 feet north of; road to east fence line, chisel marked "U.S.G.S. B.M. 438".	438.44
Wolcott, 4.9 miles south of; top of large flat rock in center of road at three corners, by large willow tree, chisel marked "U.S.G.S. B.M. 436"	436.0
Wolcott, 5.5 miles south of; top of rock on east side of road halfway up very large hill, chisel marked "U.S.G.S. B. M. 465"	465.23
South Butler; tablet set in northwest corner of schoolhouse on road east from hotel, marked "399 OSWEGO 1899"	398.757
South Butler, 0.7 mile south of; top of stone step in front of cobble stone house, chisel marked	476.44
Savannah; top of concrete post at northeast corner of Main and East Church streets; highest point marked red	419.26
Savannah, 1.1 miles south of; top of rock on east side of road, 3 feet inside of fence, 300 feet south of small hill, chisel marked "U.S.G.S. B.M. 478"	478.03
Savannah, 2.5 miles south of; top of rock on east side of road in front of wood-colored house on west side, chisel marked "U.S.G.S. B.M. 453"	452.71
Savannah, 4 miles south of; top of rock on north side of road 6 feet from fence 20 feet east of schoolhouse fence, chisel marked "U.S.G.S. B.M. 476"	475.94

	Feet.
Savannah, 4.8 miles south of; top of copper bolt set in top of first step north abutment, west wing, Barry bridge No. 1, Western division, marked "B.M. 2"	394.26
Savannah, 5.8 miles south of; top of stone wing of west abutment north side bridge seat, stone, chisel marked "U.S.G.S. B.M. 390"	390.01
Savannah, 5.9 miles south of; top of large rock on towpath east of Barry bridge, marked "B.M. 394"	394.28
Savannah, 6.6 miles south of; tablet set in south abutment, west wing, third step of Mays Canal bridge, Mays Point, marked "396 Oswego 1899"	395.765
Savannah, 8.1 miles south of; top of large rock on west side of road by fence, marked "U.S.G.S. B.M. 392"	392.31
Savannah, 10.5 miles south of; top of rock on east side of road 400 feet south of east road, chisel marked "U.S.G.S. B.M. 440"	449.92
Seneca Falls, top of fire plug on west side of Cayuga street in front of William Lathrum's brick house	480.58
Seneca Falls; tablet set in south face wall of Mynderse Academy on North Park street, marked "465"	465.174

SENECA FALLS, VIA OVID CENTER, TO ITHACA.

	Feet.
Seneca Falls, 1.1 miles south of; top of rock on east side of road by water trough, chisel marked "U.S.G.S. B.M. 462."	472.18
Seneca Falls, 2 miles south of; top of rock on east side of road by old barns, chisel marked "U.S.G.S. B.M. 474"	484.33
Seneca Falls, 4 miles south of; top of rock at west end of small culvert 200 feet south of large square house, chisel marked "U.S.G.S. B.M. 533"	542.47
Seneca Falls, 5.6 miles south of; top of large rock on west side of road under apple tree 250 feet north of red barn, chisel marked "U.S.G.S. B.M. 541"	551.33
Barrytown; tablet set in northwest corner of Dutch Reform church, marked "612 Oswego 1899"	612.423
Barrytown, 1 mile south of; top of rock on east side of road 20 feet from road, chisel marked "U.S.G.S. B.M. 654"	664.08
Barrytown, 2.9 miles south of; top of large rock on west side of road at driveway opposite to road to east, chisel marked	695.64
Barrytown, 4 miles south of; top of rock on southwest corner of road to west, chisel marked "B.M. 690"	700.20
Barrytown, 6 miles south of; top of iron bolt set in rock on south side of railroad 30 feet west of road, marked "B.M. 333" (L.V.) and "U.S.G.S. B.M. 732"	741.82
Barrytown, 6.6 miles south of; top of iron bolt 20 feet east of red farm gate, 1,500 feet east of railroad crossing, marked "B.M. 333" (L. V.) "U.S.G.S. B.M. 729"	739.38
Barrytown, 7.5 miles south of; top of large rock on south side of track 100 feet west of farm crossing, marked "U.S.G.S. B.M. 742"	751.67
Hayts Corners, top of white rock at northeast corner of railroad fence at railroad crossing 75 feet east of, marked "U.S.G.S. 782" on fence	791.74
Hayts Corners, 1.1 miles south of; top of rock at railroad crossing on west side of track 3 feet north of crossing, chisel marked "B.M. 773"	783.06
Hayts Corners, 2.6 miles south of; top of rock on east side of track 60 feet south of creek, chisel marked "U.S.G.S. B.M. 791"	801.04

	Feet.
Ovid Center, top of northeast spike in switch stand at station crossroads, marked "B.M. 808" on pole	818.41
Ovid Center, 0.8 mile south of; top of wall of south abutment of Ovid Center bridge, east side, chisel marked "U.S.G.S. B.M. 800"	810.33
Ovid Center, 1.4 miles south of; top of rock on east side of track at north end of railroad cut, chisel marked "U.S.G.S. B.M. 804"	813.60
Ovid Center, 2.5 miles south of; top of iron rod set in bridge seat of cattle pass, northeast side, L.H.B.M. No. 325, marked "U.S.G.S. B.M. 811"	821.15
Farmer; tablet set in northeast corner of Baptist church, corner of Main and Lodi streets, marked "912"	911.74
Farmer, 0.7 mile south of; top of iron bolt in north wall of cattle pass on east side, marked "B.M. No. 323" "U.S.G.S. B.M. 833"	843.20
Farmer, 2.4 miles south of; top of iron rod set in stone by fence west of railroad 600 feet north of highway, marked "B.M. 322" (L.V.) and "U.S.G.S. B.M. 839"	848.50
Covert, 0.1 mile south of; top of iron rod set in masonry southeast side of cattle pass, marked "U.S.G.S. B.M. 849"	859.28
Covert, 1.4 miles south of; top of iron pin on west side of railroad set in rock, marked "320" (L.V.) "U.S.G.S. B.M. 891"	900.73
Covert, 1.9 miles south of; top of iron pin set in rock on west side of railroad 600 feet south of highway, No. 319 (L.V.), marked "U.S.G.S. B.M. 871"	881.40
Trumansburg, top of iron pin set in rock on east side of railroad at first crossing north of station, marked "No. 318" (L.V.), and "U.S.G.S. B.M. 864"	874.30
Trumansburg; tablet set in south face of Union School and Academy, marked "1000 Oswego 1899"	999.71
Trumansburg; first crossing west of station; Lehigh Valley bench mark, iron pin set in rock on north side of track	874.30
Taughannock Falls; chisel mark on parapet wall northeast corner of overhead bridge	827.43
Willow Creek; chisel mark on top of abutment southeast corner of bridge south of station	745.85
Willow Creek, 1½ miles south of; top of bowlder on side of track, marked with paint	713.84
Willow Creek, 3 miles south of; top of iron plug set in bowlder L.V., B.M. No. 311	587.01
Ithaca, 1 mile north of; top of iron plug set in rocks, L.V., B.M. 308	431.59
Ithaca, surface of water in inlet at	380.3
Ithaca, Cayuga Lake, surface of water	381.
Ithaca, top of lower hanger bolt southeast corner of Falls Creek bridge	411.03

PENNSYLVANIA—WEST VIRGINIA.

Precise Levels.

ERIE, CRAWFORD, MERCER, VENANGO, CLARION, ARMSTRONG, WESTMORELAND, ALLEGHENY, AND FAYETTE COUNTIES, PENNSYLVANIA, AND MONONGALIA COUNTY, WEST VIRGINIA.

Erie, Edinboro, Meadville, Sandy Lake, Franklin, Glenora, Foxburg, Kittanning, Freeport, McKeesport, Charleroi, Uniontown, Masontown, Morgantown, Fairmont, and Grafton Quadrangles.

The elevations in the following list are the result of a line of precise levels run during the field season of 1899 from Erie, over the Pennsylvania Railroad, to Leboeuf; thence over the Erie Railroad to Franklin, and from Franklin to Pittsburg over the Allegheny Valley Railway. Also from Grafton, West Virginia, over the Baltimore and Ohio Railroad, to Leith; thence over the Pennsylvania Railroad to Pittsburg. Between Erie and Pittsburg they are based on an aluminum tablet set in the hospital wing of Soldiers' Home at Erie, marked "635." The elevation of this is accepted as being 635.640 feet above mean sea level, as derived from the United States Engineers' bench mark at Erie, adjusted in accordance with statements on page 203 of Appendix to Nineteenth Annual Report, and page 298, Appendix to Twentieth Annual Report. Between Grafton and Pittsburg they are based on the United States Coast Survey chisel mark on coping stone at north end of central pier of railroad bridge over Tygarts Valley River. This bench mark was reduced by 0.03 meter, which is applied as a permanent correction from Hagerstown, Maryland, in accordance with the reports of the Coast Survey.

The leveling between Grafton and Pittsburg was done by Mr. E. L. McNair, assisted by Messrs. J. E. Buford and John W. Hodges, rodmen. That between Erie and Pittsburg was done by Mr. C. H. Semper, assisted by Messrs. John W. Hodges and Iddo M. Lewis.

All bench marks set in the course of this work were stamped with the word "PITTSBURG" and the date "1899," in addition to the figures of elevation, thus referring them to the central datum tablet accepted for this group of leveling, which is set in the foundation of the Seventh Avenue Hotel in Pittsburg, the adjusted elevation of which is accepted as being 738.527 feet above mean sea level at Sandy Hook. This elevation comes through five precise lines of levels, namely: United States Coast and Geodetic Survey levels from Sandy Hook and from Old Point Comfort to Hagerstown and Grafton; United States Coast and Geodetic Survey and United States Army Engineers to Albany, Oswego, and the lakes, to Erie; United States Geological Survey levels from Albany to Dunkirk; and Pennsylvania Railroad precise levels from Sandy Hook via Harrisburg to Pittsburg.

ERIE, VIA LEBOEUF AND MEADVILLE, TO FRANKLIN.

	Feet.
Erie, aluminum tablet in water table northwest corner of hospital wing of Soldiers' Home, marked "635 PITTSBURG 1899"	635.640
Erie; top of foundation of water tank at junction of Pennsylvania and Lake Shore railroads, marked 685	685.47
Erie, 3.4 miles east of; top of south rail at railroad crossing	837.1
Erie, 3.6 miles south of; top of south rail at railroad crossing	859.2
Erie, 4.4 miles east of; top of south rail at railroad crossing	908.2
Erie, 5.2 miles south of; top of north rail at railroad crossing	967.1
Erie, 5.8 miles east of; top of rail at railroad crossing	1,004.4
Belle Valley; top of rail front of station	1,015.0
Belle Valley, 0.4 mile south of; top of north rail at railroad crossing	1,041.8
Belle Valley, 1.1 miles south of; aluminum tablet set in north end of east side of foundation of bent of overhead highway bridge, marked "1103 PITTSBURG 1899"	1,102.958
Langdon; top of rail main track of railroad crossing at station	1,134.3
Langdon, 1.2 miles south of; top of mill at railroad crossing	1,153.4
Langdon, 1.3 miles south of; top of rail at railroad crossing	1,158.9
Langdon, 2.0 miles south of; top of rail at railroad crossing	1,187.2
Langdon, 2.8 miles south of; top of rail at railroad crossing	1,208.5
Jackson; top of rail main track front of station	1,228.9
Samson; top of rail at railroad crossing by station	1,219.5
Samson, 0.8 mile south of; aluminum tablet set in top of arch masonry north end east side of railroad bridge No. 8, marked "1214 PITTSBURG 1899"	1,214.865
Samson, 0.8 mile south of; Pennsylvania Railroad bench mark No. 85, bridge No. 8, copper bolt	1,211.614
Samson, 2.4 miles south of; top of rail at railroad crossing	1,208.5
Samson, 3.5 miles south of; top of rail at railroad crossing	1,208.1
Samson, 4.3 miles south of; Pennsylvania Railroad bench mark No. 82, bridge No. 14	1,190.630
Waterford, top of rail front of station	1,191.9
Waterford, 0.5 mile south of; top of west rail at railroad crossing first road north of highway bridge	1,191.4
Leboeuf, 1.5 miles west of; on New York, Pennsylvania and Ohio Railroad, aluminum tablet set in creek masonry, on north side of railroad, marked "1193 PITTSBURG 1899"	1,193.858
Leboeuf, 2 miles west of; top of rail at railroad crossing	1,209.3
Leboeuf, 2.4 miles west of; top of rail at railroad crossing	1,210.6
Mill Village, top of rail front of station	1,213.9
Mill Village, 1 mile west of; top of rail at railroad crossing, by brick house.	1,211.9
Mill Village, 1.5 miles west of; top of rail at railroad crossing	1,205.6
Mill Village, 2.1 miles south of; top of rail at railroad crossing	1,178.2
Mill Village, 2.4 miles south of; top of rail at railroad crossing	1,164.2
Mill Village, 4.7 miles south of; top of rail at railroad crossing, at railroad water tank	1,162.8
Millers; top of rail, main track, front of station	1,169.5
Millers, 0.9 mile west of; aluminum tablet set in top of southwest end of bridge abutment, marked "1148 PITTSBURG 1899"	1,147.922
Cambridge Springs; top of rail front of station	1,161.3
Cambridge Springs, 2.6 miles west of; top of rail at railroad crossing	1,193.9
Venango; top of rail front of station	1,160.8
Venango, 0.8 mile west of; bronze tablet set in southeast end of bridge abutment, marked "1128 PITTSBURG 1899"	1,128.432

	Feet.
Venango, 2.6 miles west of; top of north rail at railroad crossing	1, 148. 4
Saegerstown, 1.3 miles east of; top of north rail at railroad crossing	1, 142. 9
Saegerstown, 1.0 mile east of; top of north rail at railroad crossing	1, 140. 2
Saegerstown; top of rail front of station	1, 113. 7
Saegerstown, 0.7 mile west of; bronze tablet set in east abutment south side of railroad bridge, marked "1109 PITTSBURG 1899"	1, 108. 974
Saegerstown, 2.1 miles west of; top of rail at railroad crossing	1, 144. 5
Saegerstown, 2.5 miles west of; top of north rail at railroad crossing	1, 127. 8
Saegerstown, 4.1 miles west of; top of north rail at railroad crossing by old wooden bridge	1, 097. 1
Meadville, 0.5 mile east of; top of rail at railroad crossing of street railway and Erie Railroad	1, 081. 9
Meadville; top of rail front of station	1, 078. 4
Meadville, 1.8 miles west of; bronze table set in creek abutment north side of railroad, east end of, marked "1071 PITTSBURG 1899"	1, 071. 884
Buchanan, top of rail front of station	1, 073. 1
Buchanan, 0. 4 mile south of; top of rail at railroad crossing	1, 069. 7
Shaws; top of east rail front of station	1, 090. 3
Shaws; 0. 9 mile south of; top of rail at railroad crossing	1, 075. 1
Cochranton, 1,000 feet north of; bronze tablet set in abutment of railroad iron bridge, north end, east side; marked "1062 PITTSBURG 1899"	1, 062. 209
Cochranton; top of rail front of station	1, 062. 1
Carlton; top of west rail front of station	1, 045. 1
Utica; top of rail front of station	1, 033. 4
Utica; bronze tablet set in east abutment north side of highway bridge, 300 feet south of station, marked "1038 PITTSBURG 1899"	1, 038. 169
Takitezy; top of rail at railroad crossing by station	1, 017. 6
Sugar Creek, 1,200 feet south of; bronze tablet set in northeast end of abutment of railroad bridge, marked "1013 PITTSBURG 1899"	1, 013. 499
Sugar Creek, 1. 0 mile south of; top of east rail at railroad crossing	999. 0
Sugar Creek, 1. 6 miles south of; top of east rail at railroad crossing	996. 5
Franklin; aluminum tablet set in northeast corner of belt course of Erie station, marked "989 PITTSBURG 1899"	989. 235
Franklin; Allegheny Valley Railway station, 90 feet west of center of track, at point 60 feet north of north end of station, in second step below copingstone at end of south wing wall of east abutment of road bridge across Allegheny River, aluminum tablet, marked "987 PITTSBURG 1899"	987. 671
Franklin, Allegheny Valley Railway station; west rail at	984. 2

FRANKLIN, VIA KITTANNING, TO PITTSBURG.

Franklin, Allegheny Valley Railway station, 1.1 miles south of; south rail at road crossing	981. 4
Cochran station; south rail opposite	978. 1
Astral flag station; north rail at	973. 7
East Sandy, Allegheny Valley Railway station, 650 feet north of; coping stone of abutment at southwest corner of 2-span steel truss bridge across East Sandy Creek; 1.2 feet below top rail 10½ feet west of center of track; bronze tablet, marked "970 PITTSBURG 1899"	970. 814
East Sandy station; east rail at	970. 4
Foster flag station; north rail at	965. 2
Brandon station; south rail at	957. 4
Brandon station; 1⅛ mile south of; west rail at milepost 112	953. 9

	Feet.
Brandon, Allegheny Valley Railway station, 1.3 miles south of; face of rock ledge 20 feet southeast of center of track; 3 feet above top of rail; 1,100 feet south of milepost 112; bronze tablet, marked "957 PITTSBURG 1899"	957.645
Kennerdell, Allegheny Valley Railway station; west rail at	943.9
Kennerdell, Allegheny Valley Railway station, 0.4 mile south of; west rail at road crossing	943.8
Kennerdell, Allegheny Valley Railway station, 1.5 miles south of; 300 feet west of milepost 106, large bowlder 10 feet north of center of track, 2.4 feet above rail; bronze tablet, marked "941 PITTSBURG 1899"	942.319
Kennerdell, 2 miles south of; west rail at milepost 104	935.8
St. George, ½ mile north of; west rail at milepost 103	932.3
St. George station, 0.3 mile south of; bronze tablet set in rock on west side of rail, 150 feet south of whistling post, marked "PITTSBURG 925 1899"	926.140
Rockland, 0.1 mile south of; bronze tablet set in northwest wing abutment of small creek, 600 feet south of station on west side of railroad, marked "919 PITTSBURG 1899"	920.759
Wood Hill; top of west rail in front of station sign	917.4
Shippingport crossing; top of east rail of middle crossing	913.1
Wood Hill, 2.7 miles south of; top of east rail at railroad crossing by old wood colored house	912.6
Dotter, 600 feet north of; bronze tablet set in north abutment of west wing of railroad bridge, marked "PITTSBURG 905 1899"	906.108
Dotter; top of east rail in front of station	910.9
Dotter, 0.3 mile south of; top of stone milepost, marked "P 92 O.C. 40–5/10"	911.0
Emlenton, 0.4 mile south of; bronze tablet set in wing wall of railroad bridge abutment, south end west side, marked "898 PITTSBURG 1899"	899.081
Emlenton; top of south rail at road crossing at station	901.2
Emlenton, 1.2 miles south of; top of stone milepost, marked "P 88 O.C. 44–5/10"	890.7
Emlenton, 2.2 miles south of; top of stone milepost, marked "P 87 O.C. 45–5/10"	897.6
Emlenton, 3.2 miles south of; top of stone milepost, marked "P 86 O.C. 46–5/10"	896.5
Foxburg; top of east rail front of depot	891.9
Foxburg; 0.4 mile south of; top of stone milepost, marked "P 85 O. C. 47–5/10"	893.02
Foxburg, 1.4 miles south of; top of stone milepost, marked "P 84 O. C. 48–5/10"	891.6
Parker, bronze tablet set in top of abutment of road bridge at station, east abutment south side marked "PITTSBURG 883 1899"	884.027
Parker; top of stone milepost marked "P 83 O. C. 49–5/10"	887.9
Parker, 0.9 mile south of; top of stone milepost, marked "P 80 O. C. 50–5/10"	885.2
Parker, 3.0 miles south of; top of stone milepost, marked "P 80 O. C. 52–5/10"	874.6
Monterey, top of south rail front of station	870.8
Monterey; 900 feet south of station, bronze tablet set in bridge abutment, north end, east side, marked "PITTSBURG 869 1899"	870.069
Monterey, 0.8 mile south of; railroad crossing top of south rail	868.6

	Feet.
Monterey, 1.0 mile south of; top of stone side post, marked "P 77 O. C. 55–5/10"	869.7
Monterey, 1.6 miles south of; top of south rail, railroad crossing	866.2
Monterey, 2.0 miles south of; top of stone milepost, marked "P 76 O. C. 56–5/10"	868.9
Upper Hillville; top of south rail front of station	863.7
Lower Hillville; top of west rail front of station	860.6
Lower Hillville, 1.0 mile south of; bronze tablet set in top of culvert wall of small stream northeast side marked "PITTSBURG 855, 1899"	856.426
Lower Hillville; top of stone milepost, marked "P 74 O. C. 58–5/10"	863.8
Lower Hillville; 1.0 mile south of; top of stone milepost, marked "P 73 O. C. 59–5/10"	860.3
Catfish Run, 1,000 feet north of; top of stone milepost, marked "P 72 O. C. 60–5/10"	859.3
Catfish Run; top of east rail front of station	854.7
Catfish Run, 0.6 mile south of; top of stone milepost, marked "P. 71, O. C. 61–5/10"	856.2
Catfish Run, 1.6 miles south of; top of stone milepost, marked "P. 70, O. C. 62–5/10"	856.2
East Brady; bronze tablet set in east abutment wing wall of steel highway bridge, marked "PITTSBURG 852, 1899"	852.697
Phillipston; top of stone milepost front of station, marked "P. 66, O. C. 66–5/10"	853.5
Phillipston, 2 miles south of; top of stone milepost, marked "P. 64, O. C. 68–5/10"	849.2
Redbank; top of west rail front of station	846.3
Redbank; bronze tablet set in north abutment of Allegheny Valley Railway bridge, 600 feet south of station, west side of abutment, marked "PITTSBURG 844, 1899"	844.816
Redbank, 1.3 miles south of; top of stone milepost, marked "P. 62, O. C. 70–5/10"	843.4
Riverview; top of rail front of station	835.5
Rimerton; top of west rail front of station	832.3
Rimerton, 0.5 mile south of; top of stone milepost, marked "P. 59 and O. C. 73–5/10"	831.7
Rimerton, 2 miles south of; bronze tablet set in north abutment west side of iron bridge, marked "PITTSBURG 820, 1899"	820.895
Rimerton, 3.5 miles south of; top of stone milepost, marked "P. 56 and O. C. 76–5/10"	824.0
Rimerton, 3.8 miles south of; top of east rail at railroad crossing	821.6
Mahoning; top of east rail front of station	818.9
Templeton; top of west rail front of station	819.2
Templeton, 0.6 mile south of; top of west rail at railroad crossing	818.4
Templeton, 1.9 miles south of; top of west rail at railroad crossing	813.8
Templeton, 1.6 miles south of; top of west rail at railroad crossing	814.8
Templeton, 2.4 miles south of; top of west rail at railroad crossing	814.0
Templeton, 2.7 miles south of; top of stone milepost, marked "P. 51 and O. C. 81.5"	815.5
Mosgrove; bronze tablet set in north abutment east end of railroad bridge, 900 feet north of station, marked "PITTSBURG 806, 1899"	807.334
Mosgrove, 0.6 mile south of; top of stone milepost marked "P. 49, O. C. 83–5/10"	807.9
Cowanshannock; top of east rail front of station	805.5

	Feet.
Cowanshannock; 1.5 miles south of; top of stone milepost, marked "P. 46, O. C. 86–5/10"	807.6
Neal; top of west rail on last crossing south of station	805.4
Wick City; top of west rail at crossing at pottery works	805.4
Kittanning; top of east rail front of station	806.5
Kittanning; bronze tablet set on front face northwest corner of public school on corner of McKain and Vine streets, marked "PITTSBURG 803, 1899"	803.622
Garretts Run; top of west rail front of station	796.2
Manorville; top of east rail front of station	796.1
Graff; top of west rail front of station	790.5
Ford City; top of east rail front of station	784.9
Ford City, 0.5 mile south of; top of stone milepost marked "P. 40, O. C"	784.7
Rosston; top of west rail front of station	786.7
Logansport; top of west rail front of station	781.8
Rosston, 0.2 mile south of; bronze tablet set in east abutment of bridge over river, marked "PITTSBURG 786, 1899"	787.178
Kelley; top of west rail front of station	778.4
White Rock; top of east rail main track front of station	780.7
White Rock, 1.2 miles south of; top of west rail at railroad crossing	778.9
Donley; top of south rail front of station	782.3
Donley, 1.2 miles south of; top of east rail at railroad crossing by stone milepost marked "P. 30" and "O. C. 102–5/10"	791.1
West Penn Junction; bronze tablet set in foundation wall of turntable of Allegheny Valley Railway and Pennsylvania Railroad, marked "PITTSBURG, 788, 1899"	788.743
West Penn Junction; copper bolt set in turntable wall of Allegheny Valley Railway and Pennsylvania Railroad, marked "788.85" (Pennsylvania Railroad B. M.)	788.724
Garvers Ferry; top ot west rail front of station	783.9
Garvers Ferry, 1.3 miles south of; top of stone milepost, marked "P. 26, O. C. 106–5/10"	780.8
McKain; top of west rail front of station	776.8
McKain, 0.7 mile south of; top of stone milepost, marked "P. 25, O. C. 107–5/10"	776.4
Metcalf; top of west rail front of station	773.7
Metcalf, 0.8 mile south of; top of stone milepost, marked "P. 24, O. C. 108–5/10"	772.6
Metcalf, 1.3 miles south of; top of west rail at railroad crossing	766.8
Braeburn; top of west rail front of station	759.9
Edgecliff, 1,000 feet south of; bronze tablet set in north abutment east side of bridge over creek, marked "PITTSBURG 764, 1899"	763.6
Crag Dell; top of west rail front of station	776.4
Valley Camp; top of west rail main track front of station	787.3
Arnold; top of west rail main track front of station	786.2
New Kensington; top of west rail front of station	775.2
Parnassus; top of west rail front of station	763.2
Parnassus, 0.5 mile south of; top of stone milepost, marked "P. 17, O. C. 115–5/10"	758.1
Logans Ferry; top of east rail north-bound track front of station	755.9
Barking; top of east rail south-bound track front of station	759.2
Blacks Run; bronze tablet set in face of stone milepost, marked "P. 13, O. C. 119–5/10" 300 feet south of Bessemer steel railroad bridge over Allegheny River, marked "PITTSBURG 770, 1899"	771.350

	Feet.
Hulton; top of east rail front of station	776.8
Oakmont; top of west rail front of station	763.8
Edgewater; top of west rail front of station	753.8
Verona; top of west rail front of station	745.0
Sylvan; top of west rail front of station	744.3
Sylvan, 0.5 mile south of; top of west rail at railroad crossing	745.3
Sandy Creek; top of west rail front of station	745.0
Wildwood; top of west rail front of station	745.9
Wildwood; copper bolt in doorsill of Pennsylvania Water Company house, west door	748.978
Brilliant; top of north rail front of station	746.7
Brilliant, 0.3 mile south of; bronze tablet set in wall of small culvert south side of railroad, marked "Pittsburg 745 1899"	745.503
Morningside; top of north rail front of station	746.0
Pittsburg, Butler street station; top of west rail front of	743.1
Pittsburg; top of stone milepost, marked "P 3 O. C. 129-5/10"	739.5
Pittsburg, Forty-third street station; top of west rail front of	730.7
Pittsburg, Pennsylvania avenue, south side of; top of curbstone 15 feet west of Allegheny Valley Railway, marked "B. M."	736.77
Pittsburg, Liberty street, south side foundation of Washington street footbridge; copper bolt (Pennsylvania Railroad bench mark)	743.906
Pittsburg; aluminum tablet set in foundation of Seventh Avenue Hotel, north side, at main entrance to, marked "PITTSBURG 738 1899"	738.527

GRAFTON, VIA FAIRMONT, TO MORGANTOWN, WEST VIRGINIA.

	Feet.
Grafton, West Virginia; Baltimore and Ohio Railroad bridge across Tygarts Valley River; coping stone at north end of central pier, chisel marked (United States Coast Survey bench mark)	996.829
Grafton, Baltimore and Ohio station; main line, top of rail at	1,000.5
Grafton, 1.2 miles west of; south rail at road crossing	990.3
Grafton, 1½ miles west of; south rail at road crossing	989.8
Grafton, 1.7 miles west of; south rail at road crossing	990.1
Grafton, 4.8 miles west of; north rail at farm crossing	991.0
Valley Falls, 2.9 miles east of; bridge seat at northeast corner of girder bridge No. 104, 7 feet east of center of track, 4 feet below top of outer rail of curve; bronze tablet marked "986 PITTSBURG 1899"	985.580
Bush flag station, south rail at	985.2
Valley Falls, north rail at	974.9
Valley Falls, 1½ miles west of; flag station near brickyard, south rail at	942.1
Powell's flag station, south rail at	907.6
Powell's flag station, 0.3 mile west of; south rail at road crossing	901.3
Powell's flag station, ¾ mile west of; stone arch bridge No. 108, coping stone of wall, 1.1 feet below top of rail, 7 feet north of center of track; aluminum tablet marked "899 PITTSBURG 1899"	899.029
Colfax, 1.8 miles east of; south rail at road crossing	900.7
Colfax, south rail at	891.9
Benton Ferry, ½ mile east of; south rail at milepost 82	889.3
Benton Ferry, south rail at signboard	889.9
Benton Ferry, 160 feet south of signboard at; bridge seat at southwest corner of small girder bridge No. 111, 4½ feet below top of rail and 18½ feet south of center of track; bronze tablet marked "885 PITTSBURG 1899"	885.090
Fairmont, 1.3 miles east of; top of east middle pier Baltimore and Ohio Railroad bridge across Monongahela River	885.5

	Feet.
Fairmont, Baltimore and Ohio station, east rail at	883.6
Fairmont, Baltimore and Ohio station, 1¼ miles north of Baltimore and Ohio Railroad bridge No. 371, across Monongahela River; coping stone at north end of east abutment; bronze tablet marked "885 PITTSBURG 1899"	885.034
Fairmont, 2 miles north of; east rail at road crossing	878.6
Hoult, ½ mile south of; west rail at road crossing	878.1
Hoult, west rail at station	882.4
Riversville flag station, east rail at	881.3
Montana, east rail at station	875.4
Catawba, 0.8 mile south of; Baltimore and Ohio Railroad one-span truss bridge No. 369, coping stone at north end of east abutment, 3 feet below rail and 8 feet north of; bronze tablet marked "873 PITTSBURG 1899".	872.611
Catawba station, north rail at	873.0
Catawba station, 0.3 mile north of; south rail at crossing	871.2
Catawba station, 0.6 mile north of; south rail at crossing	870.2
Luther, 0.7 mile south of; north rail at road crossing	869.3
Luther, east rail at	867.9
Murray, north rail at	868.0
Opekiska, north rail at	866.2
Opekiska, ¼ mile north of; east rail at road crossing	865.5
Beechwood, south rail at	860.2
Little Falls, 1½ miles northwest of; face of rock, bluff, 9½ feet west of west rail and 4 feet above same, ½ mile north of bridge No. 366; bronze tablet marked "859 Pittsburg 1899"	858.862
Little Falls, 0.9 mile west of; north rail at road crossing	854.7
Little Falls, 0.4 mile west of; south rail at road crossing	852.6
Little Falls, north rail at station	847.3
Little Falls, 0.6 mile north of; east rail at road crossing	836.3
Milepost 110, south rail at	832.9
Uffington, 0.8 mile south of; north rail at road crossing	833
Uffington station, north rail at	831.3
Uffington station, 400 feet north of; coping stone of abutment at northwest corner of one-span truss bridge No. 364, 3 feet below top of rail and 7 feet north of rail; aluminum tablet marked "828 Pittsburg 1899"	827.908
Russell siding, 0.3 mile south of; west rail at road crossing	824.8
Russell siding, east rail at	822.6
Morgantown, Baltimore and Ohio station, 480 feet south of; coping stone of abutment at northwest corner of truss bridge over Deckers Creek; bronze tablet marked "821 PITTSBURG 1899"	820.900

MORGANTOWN, WEST VIRGINIA, TO UNIONTOWN, PENNSYLVANIA.

Morgantown, Baltimore and Ohio station; east rail at	823.1
Morgantown, ¾ mile north of; east rail at road crossing	829.9
Randall flag station, ¼ mile south of; west rail at road crossing	825
Randall flag station, east rail at	824.5
Milepost 98, west rail at	827.3
Vanvorhis, 1 mile south of; bridge seat at southeast corner of steel girder bridge No. 359; bronze tablet marked "815 PITTSBURG 1899"	815.253
Van Vorhis station, west rail at	818
Hoard flag station, east rail at	817
State-line post (West Virginia-Pennsylvania), east rail at	815.3
Point Marion station, west rail at	815.3

	Feet.
Point Marion station, ¼ mile north of; coping stone at east end of north pier of six-span truss and girder bridge No. 356 across Cheat River; bronze tablet, marked "813 PITTSBURG 1899"	812,911
Point Marion, 1 mile north of; west rail at road crossing	815.1
Cheat Haven station, west rail at	835.4
Bridge 354, outer rail at north end of	858.9
Bridge 353, outer rail at north end of	904.4
Bridge 352, outer rail at north end of	918.6
Atcheson flag station, east rail at	939.1
Gans station, west rail at	1,009.5
Outcrop flag station, 0.6 mile south of; east rail at road crossing	1,077.7
Summit of grade, top of rail at	1,089.5
Outcrop flag station, 0.2 mile south of; northeast of Baltimore and Ohio tunnel, east side of track, 3.7 feet above rail; bronze tablet marked "1084 PITTSBURG 1899"	1,083.891
Outcrop flag station, east rail at	1,067.5
Outcrop flag station, 1.1 miles north of; west rail at road crossing	996.
Smithfield, 1¼ miles south of; east rail at water tank	985.6
Smithfield, 0.8 mile south of; east rail at road crossing	985.0
Smithfield station, west rail at	985.6
Smithfield station, 1 mile north of; east rail at road crossing	979.5
Fairchance, 1.1 miles south of; west rail at road crossing	1,000.2
Fairchance, 0.5 mile south of; east rail at road crossing	1,021.8
Fairchance station, west rail at	1,059.9
Fairchance, Baltimore and Ohio station, 550 feet north of; bridge seat at corner of small girder bridge No. 338; aluminum tablet marked "1065 PITTSBURG 1899"	1,065.243
Milepost 77, west rail at	1,097.3
Johnston flag station, west rail at	1,098.7
Johnston flag station, ¾ mile north of; east rail at road crossing	1,127.5
Oliphant flag station, ¼ mile south of; west rail at road crossing	1,152.7
Oliphant flag station, west rail at	1,170.7
Oliphant flag station, ½ mile north of; west rail at road crossing	1,187.5
Brownfield station, west rail at	1,136.6
Hutcherson flag station, east rail at	1,106.2
Hutcherson flag station, ¾ mile north of; east rail at road crossing	1,058.1
Hutcherson flag station, 1.2 miles north of; east rail at road crossing	1,030.4
Hutcherson flag station, 1.3 miles north of; east rail at road crossing	1,025.1
Leith flag station, Pennsylvania Railroad, west rail at	1,006.0
Leith flag station, 0.3 mile north of; east rail at road crossing	993.5
Uniontown, East Fayette street crossing; east rail at	979.1
Uniontown, Pennsylvania Railroad station; east rail at	980.8
Uniontown, John Lynch & Co.'s store, corner of curbstone at	979.41
Uniontown, southwest corner of Penn and Broad streets, top of large stone post	975.62

UNIONTOWN, ALONG BALTIMORE AND OHIO RAILROAD, TO PITTSBURG.

Uniontown, court-house; corner of Main and Court streets, foundation wall 4 feet above ground, between Main street entrance and southwest corner of building. Aluminum tablet marked "999 PITTSBURG 1899".	998.899
Redstone Junction, east rail at	956.2
Walker's flag station, west rail at	956.6
Vance Mill Junction, 1 mile south of; west rail at road crossing	936.1

	Feet.
Vance Mill Junction; east rail at	927.1
Upper Middletown flag station; east rail at	913.9
Upper Middletown flag station, 675 feet north of; face of rock in place, 26 feet east of; center of track and 4.2 feet higher than top of rail; bronze tablet marked "920 PITTSBURG 1899"	919.773
Waltersburg flag station; west rail at	900.3
Waltersburg flag station; 0.3 mile north of; west rail at road crossing	893.1
Rothruck flag station; west rail at	892.4
Smock station; east rail at	877.8
Tippecanoe flag station, ½ mile south of; bridge seat at southwest corner of small girder bridge 15 feet long over roadway at south end of truss road bridge over Redstone Creek; bronze tablet marked "868 PITTSBURG 1899"	867.546
Tippecanoe flag station; west rail at	859.5
Tippecanoe flag station, ¾ mile north of; east rail at road crossing	845.7
Grindstone flag station, west rail at	825.5
Braznell flag station; east rail at	798.9
Braznell flag station, ¾ mile north of; east rail at road crossing	787.3
West Brownsville Junction, ¼ mile south of; 4-span truss bridge across Monongahela River; bridge seat at east end of north abutment; bronze tablet marked "778 PITTSBURG 1899"	777.666
West Brownville Junction; east rail at	778.4
California station; east rail at	766.5
Coal Center station; west rail at	769.0
Woods Run flag station, ½ mile south of; bridge seat at east end of north abutment of open culvert, 25 feet south of milepost 47; bronze tablet marked "764 PITTSBURG 1899"	764.074
Woods Run flag station; west rail at	765.1
Lucyville, 0.4 mile south of; west rail at road crossing	766.2
Lucyville station; west rail at	766.8
Stockdale flag station; east rail at	761.9
Allenport station; west rail at	764.6
Allenport station, 0.9 mile north of; west rail at road crossing	766.9
Dunlevy flag station; west rail at	763.5
Dunlevy flag station, 0.3 mile north of; east rail at road crossing	763.9
Belle Vernon station; east rail at	767.3
Belle Vernon station, ½ mile north of; west rail at road crossing	761.0
Charleroi station, ½ mile south of; 150 feet south of city pumping station, coping stone at northwest corner of large stone arch culvert; bronze tablet market "760 PITTSBURG 1899"	757.835
Charleroi station; west rail at	764.1
Lock No. 4 station; west rail at	764.8
Lock No. 4; chisel mark on circle on coping stone near heel of west gate at south end of west lock	743.765
Bamford station; east rail at	764.0
Bamford station, 0.3 mile north of; west rail at road crossing	769.7
West Columbia flag station; west rail at	773.0
Webster station; west rail at	761.2
Webster station, 0.6 mile north of; west rail at road crossing	760.9
Baird flag station; east rail at	760.1
Baird flag station, 150 feet south of station; signpost, second step below coping stone of stone arch culvert, north side of track and 4.8 feet below top rail; bronze tablet marked "755 PITTSBURG 1899"	755.064

	Feet.
Black Diamond flag station; west rail at	754.0
Monongahela City, 0.4 mile south of; top of rail at road crossing	751.0
Monongahela City station; top of rail at	753.9
Riverview flag station; east rail at	755.4
Riverview flag station, 0.3 mile north of; large stone arch culvert, south end of; west side of track, second step below coping stone, 2½ feet below top of rail; bronze tablet marked "753 PITTSBURG 1899"	753.197
Courtney station; east rail at	759.2
Huston Run; west rail of north-bound track	754.9
Coal Bluff; east rail of south-bound track	750.8
Shire Oaks; west rail of north-bound track	750.2
Elben; west rail of north-bound track	751.7
Walton flag station; east rail of south-bound track	756.5
Jones flag station; east rail of north-bound track	754.4
West Elizabeth station; east rail of north-bound track	746.5
East Elizabeth; west rail of north-bound track	750.2
East Elizabeth, 0.6 mile north of; west rail of north-bound track at road crossing	751.3
Central Park; west rail of north-bound track at road crossing	755.0
Blair flag station; east rail of north-bound track	757.7
Peters Creek flag station, ¼ mile south of; large 2-span stone arch culvert, first step below coping stone at southeast corner of; 12 feet below top of rail; bronze tablet marked "740 PITTSBURG 1899"	739.573
Peters Creek, flag station; east rail of south-bound track at	752.6
Wilson station; west rail of south-bound track at	756.6
Coal Valley station; west rail of south-bound track at	754.3
Coal Valley, county bridge over creek; square on coping stone of wall (Pennsylvania Railroad bench No. 19, their elevation 736.60)	736.43
Camden flag station; east side of north-bound track	753.8
Dravosburg; west rail of south-bound track at station	746.8
Cochran station, 1.1 miles south of; east rail of north-bound track at road crossing	751.6
Cochran station (Duquesne post-office); east rail of south-bound track at.	761.2
Thomson flag station; west rail of south-bound track at	763.0
Thompson flag station, 125 feet south of; signal tower at, 25 feet west of south-bound track, 4 feet above top of rail, north wing wall of west abutment of double-track truss bridge of Union Railway crossing over tracks of Pennsylvania Railroad; bronze tablet, marked "757 PITTSBURG 1899"	767.018
Thompson flag station, ⅓ mile south of (Pennsylvania Railroad bench mark No. 13); copper bolt in coping stone at south end of west abutment of Port Perry Railroad bridge across Monongahela River	763.997
Bessemer station, Pennsylvania Railroad, about 1 mile east of; east end of north abutment of double-track bridge of Union Railway over main line of Pennsylvania Railroad; in face of abutment, bronze tablet, marked "760 PITTSBURG 1899"	759.631
Braddock station, copper bolt in doorsill of door to ladies' waiting room (Pennsylvania Railroad bench mark)	828.879
Hawkins station, top of rail	881.2
Swissvale station, west rail of west track at	921.8
Edgewood station, west rail at	922.2
Wilkinsburg station, west rail at	922.1

	Feet.
Homewood station, copper bolt in doorsill of (Pennsylvania Railroad Company's bench mark)	923.452
Homewood station, west rail at	922.3
Fifth Avenue station, west rail at	920.0
East Liberty station, west rail at	913.8
Benvenue station, ¼ mile west of; bridge seat at south end of west abutment of girder bridge over Pittsburg Junction Railway tracks; bronze tablet, marked "818 PITTSBURG 1899"	818.269
Pittsburg, Twenty-eighth street station; south rail, north side of	755.7

NEW YORK-PENNSYLVANIA.

STEUBEN COUNTY, NEW YORK; TIOGA AND POTTER COUNTIES, PENNSYLVANIA.

Corning, Gaines, Elkland, and Tioga Quadrangles.

The following elevations are based on an aluminum tablet placed in the State Library at Harrisburg, the elevation of which is accepted as 363.813 feet above mean sea level.

The leveling was done under the general direction of Mr. J. H. Jennings, topographer, by Messrs. C. H. Semper and Robert Coe, level men.

All bench marks dependent on this datum are marked with the letters "HARRISBURG," in addition to their figures of elevation.

ADDISON, NEW YORK, TO ELKLAND, PENNSYLVANIA.

Addison, Erie station, 0.4 miles east of, and 750 feet northeast of tracks; Union School building, at right of main entrance to; aluminum tablet, marked "1021 D"	1,021.748
Addison, 1.3 miles south of; top of abutment east end of bridge, north side, chisel marked "U.S.G.S., B.M. 988"	987.73
Freeman, 1.2 miles south of; top of rock on east side of railroad, marked "U.S.G.S., B.M. 1308"	1,308.70
Freeman, 4.2 miles south of; top of spike in top of trestle on east side of railroad, chisel marked "U.S.G.S., B.M. 1390"	1,389.78
Freeman, 5.1 miles south of; top of bolt in guard rail at northeast end of trestle culvert, chisel marked "U.S.G.S., B.M. 1346"	1,345.63
Freeman, 6 miles south of; top of spike in culvert timber, 50 feet west of Nelson flag station, on east side of railroad, chisel marked "U.S.G.S. B.M. 1295"	1,294.72
Elkland; top of spike in timber culvert on west side of railroad, 100 feet north of tannery switch, chisel marked "U.S.G.S., B.M. 1146"	1,145.53
Elkland; tablet set in front face of Pattison Bank, on West Main street, marked "1134 HARRISBURG 1899"	1,133.632

ELKLAND TO LAWRENCEVILLE.

Nelson; top of coping stone of culvert, 200 feet west of station, south side of railroad, chisel marked "U.S.G.S., B.M 1171"	1,170.96
Nelson; tablet set in southeast corner of Nelson schoolhouse, marked "1077 HARRISBURG 1899"	1,077.178
Nelson, 1 mile east of; on top stone at north end east abutment of small bridge, 350 feet east of milepost 80-33	1,120.75

	Feet.
Pritchard; railroad spike in second telegraph pole west of section house	1,016.11
Lawrenceville, 1½ miles west of; on top of stone at north end of east abutment of New York Central and Hudson River Railroad bridge over Cowanesque River	1,011.49
Lawrenceville; aluminum tablet in top foundation stone on south side near southeast corner of building at northwest corner of Main and Cowanesque streets, owned by estate of J. F. Rushling and occupied by Wing & Bostwick as a general store, marked "996 HARRISBURG 1899"	995.992

ELKLAND TO ACADEMY CORNERS.

	Feet.
Osceola; top of bolt in guard rail on wooden bridge 600 feet west of station, north side, west end of bridge, chisel marked "U.S.G.S., B.M. 1155"	1,155.47
Osceola, 1.9 miles west of; top of bolt in guard rail of culvert, on south side, chisel marked "U.S.G.S. B.M. 1177"	1,177.35
Academy Corners; tablet set in southeast corner of district schoolhouse, marked "1216 HARRISBURG 1899"	1,215.925

ACADEMY CORNERS, VIA LITTLE MARSH AND KEENEYVILLE, TO MIDDLEBURY.

	Feet.
Academy Corners, 6 miles south of; on rock on south side of road culvert, in culvert wall, 100 feet west of forks in road, junction of Close and Bates Hill roads, ½ mile north of Little Marsh, chisel marked "U.S.G.S. B.M. 1590"	1,590.41
Little Marsh, at east end of village of; copper tablet in top of third stone from east end of north abutment of iron highway bridge over Crooked Creek, marked "1392 HARRISBURG 1899"	1,392.384
Little Marsh, 1 mile east of; on point of a bowlder on left side, 70 feet east of a small bridge	1,384.87
Chatham Valley, ½ mile east of; on rock on left of road, at north end of small culvert	1,314.06
Keeneyville, 1½ miles west of; on flat bowlder 10 feet to right of road, near barn of Mrs. Fanny Goodwin	1,276.41
Keeneyville, ½ mile west of; on maple, 12 inches diameter, on right of road, opposite cemetery	1,277.12
Middlebury; copper tablet in top stone at south end of west pier of iron highway bridge over Crooked Creek, marked "1149 HARRISBURG 1899"	1,149.204

ACADEMY CORNERS TO WESTFIELD.

	Feet.
Knoxville; aluminum tablet set in about the middle of foundation of chimney on west side of residence of H. I. Brewster, on south side of East Main street, being the third building from corner of Main and Water streets, marked "1239 HARRISBURG 1899"	1,239.568
Knoxville; railroad spike in root of maple, 18 inches diameter, at northwest corner of New York Central and Hudson River Railroad station	1,232.57
Knoxville, 1½ miles west of; railroad spike in root of elm, 15 inches diameter, 40 feet south of track, about 2,100 feet east of milepost 49–19	1,261.94
Cowanesque, ½ mile east of; railroad spike in nearest telegraph pole to mile post K 70 (Buffalo and Susquehanna Railroad)	1,296.62
Westfield, 1 mile east of; on inside anchor bolt on north side east abutment of Buffalo and Susquehanna Railroad bridge over Cowanesque River	1,330.49

	Feet.
Westfield; aluminum tablet in east face of top foundation stone at the northeast corner of brick building at corner of Main and Church streets, owned by F. D. Strang, marked "1372 HARRISBURG 1899"	1,371.710

WESTFIELD TO BINGHAM.

Westfield, 1 mile west of; on top of stone at south end of ballast wall on west abutment of bridge 450 feet east of milepost 99-14	1,383.77
Potter Brook, 1 mile east of; on point of bowlder 10 feet to right of track.	1,439.92
Potter Brook; on east side of south end of water-tank foundation	1,463.64
Potter Brook, 1 mile west of; railroad spike in nearest telegraph pole to milepost 102-11	1,497.85
Elmer, 1 mile west of; on top of stone at south end of east abutment of bridge 100 feet west of milepost 103-10	1,546.22
Harrison Valley; copper tablet set in south face of top foundation stone at the southeast corner of brick building owned by G. E. and D. T. Stone, marked "1618 HARRISBURG 1899"	1,618.463
Harrison Valley, 1 mile west of; railroad spike in top of corner pile at east abutment of bridge 1,150 feet west of milepost 105-8	1,660.69
Mills; railroad spike in root of cherry tree 18 inches diameter, 40 feet south of track near dancing pavilion at I. O. O. F. Park	1,721.28
Mills, 2½ miles west of; copper tablet in top of corner coping stone on north side of east abutment of bridge about 1,100 feet east of milepost 109-4, marked "2022 HARRISBURG 1899"	2,022.077
Bingham, ¾ mile east of; on silver poplar, 15 inches diameter, 30 feet south of track and 280 feet east of east end of logging switch	2,079.04

WESTFIELD TO GAINES, SUNDERLINVILLE, GALETON, AND WEST PIKE.

Westfield, 1½ miles south of; on elm, 20 inches in diameter, 25 feet to right of track, 600 feet north of milepost K 66	1,457.15
Sabinsville, at north end of village of; copper tablet in top of corner stone on north side east abutment of iron highway bridge over Mill Creek, marked "1601 HARRISBURG 1899"	1,601.409
Sabinsville, 1 mile south of; on bowlder on right of track in cut	1,553.57
Sabinsville, 2 miles south of; railroad spike in birch, 18 inches diameter, 40 feet left of track, near south end of Summit siding	1,727.99
Lansing, 1 mile north of; on bowlder on right of track, 480 feet north of milepost K 60	1,612.01
Lansing (railroad station is Davis); railroad spike in first telegraph pole at north end of railroad station	1,530.61
Lansing, 1 mile south of; on outside spike of switch stand at Gurnee switch	1,482.15
Gaines, 3 miles north of; on bowlder on right of track, 780 feet north of milepost K 57	1,442.11
Gaines; copper tablet in south face of foundation stone at the southeast corner of Hotel Vermilyea, marked "1294 HARRISBURG 1899"	1,294.145
Gaines, 1 mile west of; on top of ballast wall on south side of east abutment of steel railroad bridge over Pine Creek	1,262.32
Galeton, 2 miles east of; on bowlder 6 feet to left of track, 110 feet west of milepost K 51	1,291.05
Galeton; on top of stone at east end of south pier of highway bridge over Pine Creek, south of tannery	1,321.515
Galeton; aluminum tablet in window sill on east end near southeast corner of building used as general offices of Buffalo and Sesquehanna Railroad, marked "1330 HARRISBURG 1899"	1,329.978

	Feet.
Sunderlinville, 5 miles south of; on bowlder on left of road near small bridge near forks of road near saw mill	1, 412. 57
Sunderlinville, 3 miles south of; on top of stone on north side of west abutment of iron highway bridge over Phœnix Creek	1, 497. 91
Sunderlinville, 1 mile south of; on elm, 36 inches diameter, 15 feet to left of road, near top of hill	1, 693. 72
Sunderlinville; aluminum tablet in west face of foundation stone near northwest corner of building used as hotel, owned by E. S. Worden, at the southwest corner of the forks of road, marked "1738 HARRISBURG 1899"	1, 738. 203
Galeton, 1¾ miles northwest of; on top of ballast wall on east side of north abutment of steel bridge	1, 364. 68
West Pike; 1 mile southeast of; railroad spike in root of hemlock 70 feet to left of track and 250 feet south of highway crossing	1, 437. 77
West Pike; a square hole in top of stone at north end of west abutment of steel railroad bridge over Genesee Fork of Pine Creek	1, 461. 17

GAINES TO STOKESDALE AND WELLSBORO.

Gaines, 1 mile east of; on top of stone at north end of west abutment of iron bridge	1, 221. 17
Manhattan; on top of stone at south end of west abutment of bridge 150 feet east of railroad station	1, 208. 75
Ansonia, 3 miles west of; on top of stone at south end of west abutment of iron bridge	1, 176. 15
Ansonia, 1 mile west of; on top of stone at south end of east abutment of small bridge	1, 142. 67
Ansonia; copper tablet in top of bridge-seat stone on north side of east abutment of highway bridge over Marsh Creek 200 feet west of Fall Brook Railway, marked "1136 HARRISBURG 1899"	1, 136. 084
Ansonia, 1 mile northeast of; railroad spike in milepost 100–71	1, 143. 39
Marsh Creek, ½ mile west of; on top stone at north end of west abutment of small bridge 500 feet east of milepost 72–99	1, 152. 19
Marsh Creek, 1½ miles northeast of; railroad spike in milepost 74–97	1, 169. 89
Stokesdale Junction, 3 miles southwest of; on bowlder 5 feet to right of track and 70 feet south of milepost 75–96	1, 160. 69
Stokesdale Junction, 2 miles southwest of; on foundation of water tank near milepost 76–95	1, 158. 73
Stokesdale Junction, 1 mile southwest of; on top of stone at west end of north abutment of small bridge 400 feet south of milepost 77–94	1, 164. 59
Stokesdale; on inside anchor bolt on west side at south end of through truss railroad bridge	1, 189. 76
Wellsboro, 1 mile north of; on top of stone at west end of south abutment of bridge near milepost 15–95	1, 242. 50
Wellsboro; copper tablets in stone monuments set in public square as meridian marks. The north monument is about 7 feet from Central avenue and 42 feet from Main street. The south monument is about 13 feet from Pearl street and 26 feet from Charles street, marked "1308 HARRISBURG 1899."	
North monument	1, 307. 838
South monument	1, 308. 505

STOKESDALE TO MIDDLEBURY.

	Feet.
Stokesdale Junction; on west end of south abutment of small bridge at north end of coal shutes	1,163.64
Stokesdale Junction, 1 mile north of; on top of mile post 79–92	1,174.27
Middlebury, 2 miles south of; railroad spike in milepost 80–91	1,174.09
Middlebury, 1 mile south of; on outside rivet of east side at south end of plate girder railroad bridge	1,162.88

MIDDLEBURY, VIA EAST CHARLESTON, MANSFIELD AND PAINTER RUN TO TIOGA.

	Feet.
Middlebury, 1 mile north of; on top of coping stone at west end of north abutment of small bridge, 430 feet south of milepost 88–83	1,160.91
Crooked Creek (Holiday station), on bowlder on north side of east end of highway bridge over Crooked Creek, near railroad station	1,126.27
East Charleston, 3½ miles north of; on pine 18 inches in diameter, 20 feet to left of road, in bottom	1,255.96
East Charleston, 1 mile north of; on hickory 15 inches in diameter, 40 feet to left of road	1,491.93
East Charleston, ½ mile north of; on elm 15 inches in diameter, 15 feet to left of road, on top of hill	1,720.63
East Charleston, aluminum tablet in west face of foundation at northwest corner of brick residence of Seymour Whitney, marked "1656 HARRISBURG 1899"	1,656.091
East Charleston, 1½ miles east of; on horse block in front of brick house on right of road	1,414.82
East Charleston, 2½ miles east of; on elm 12 inches in diameter, 15 feet to left of road	1,346.75
Covington, 3 miles northwest of; on top of stone on east end of north abutment of highway bridge over North Elk Run	1,255.32
Covington, ¾ mile north of; bolt in large oak on west side of highway about 50 feet west of Erie Railroad, near highway bridge over Tioga River	1,173.43
Covington; copper tablet in west face of foundation near northwest corner of I. O. O. F. hall, which is the third building south of State street, on east side of Williams street, marked "1196 HARRISBURG 1899"	1,196.215
Covington, 1 mile north of; on hickory 40 feet east of railroad, nearly opposite milepost 36	1,169.14
Canoe Camp, ½ mile south of; on bowlder 20 feet to right of road, in front of red barn	1,155.41
Canoe Camp; on top of stone at west end of north abutment of steel railroad bridge, 90 feet north of railroad station	1,154.72
Mansfield; copper tablets set in stone monuments on the grounds of the Mansfield State Normal School for a meridian mark.	
North monument marked "1207 HARRISBURG 1899"	1,206.906
South monument marked "1196 HARRISBURG 1899"	1,196.004
Mansfield; on west side of north abutment of steel plate girder railroad bridge, 1,150 feet north of railroad station	1,127.46
Mansfield, 2 miles north of; on east end of north abutment of small bridge near highway crossing	1,111.99
Lambs Creek, 1½ miles north of; railroad spike in stump 15 feet east of track, about 1,100 feet south of milepost 28	1,080.17
Painter Run; aluminum tablet in south face of foundation near southwest corner of Free Methodist Church, at forks of road where signboard reads "Summit, 6 miles," marked "1257 HARRISBURG 1899"	1,257.441
Tioga, 2½ miles south of; on top of coping stone at west end of north abutment of steel plate girder bridge (railroad) over Mill Creek	1,061.33

	Feet.
Tioga, ¾ mile south of; on top of bridge-seat stone on west side of north pier of iron highway bridge over Tioga River	1,045.81
Tioga; copper tablet in front face of buttress on south side of south entrance of St. Andrew's Episcopal Church, marked "1036 HARRISBURG 1899"	1,036.241

MIDDLEBURY, OVER NEW YORK CENTRAL AND HUDSON RIVER RAILROAD, TO TIOGA.

Crooked Creek, 1¼ miles north of; on top of stone on west side of north abutment of small bridge, about 1,800 feet south of milepost 85–86	1,103.00
Hammond, ¼ mile south of; railroad spike in large stump 30 feet to right of track, nearly opposite milepost 84–87	1,089.81
Hammond, ¾ mile north of; on top of coping stone at west end of north abutment of small bridge, about 600 feet north of milepost 83–88	1,074.72
Tioga, 1½ miles south of; on top of stone at west end of north abutment of steel plate and lattice girder railroad bridge over Crooked Creek	1,067.76
Tioga, ½ mile south of; on top of stone at east end of north pier of steel lattice girder railroad bridge	1,062.56

TIOGA TO JACKSON SUMMIT AND TO LAWRENCEVILLE AND CORNING.

Tioga; on top of stone at north end of west abutment of highway bridge over Tioga River, near Erie Railroad station	1,037.61
Tioga, 1 mile north of; on top of stone at north end of east abutment of highway bridge over Tioga River	1,032.12
Tioga, 2 miles north of; on foundation stone on east side of north abutment of small bridge, 40 feet south of milepost 22	1,014.48
Tioga Junction; on foundation stone on south end of second row from track of water tank at railroad station	1,014.61
Tioga Junction, 1 mile east of; on bridge-seat stone on north side of east abutment of steel-plate girder bridge No. 19, about 450 feet east of milepost 19	1,109.43
Tioga Junction; on bowlder 12 feet south of track, opposite milepost 18	1,198.58
Jackson Summit, 2 miles west of; on top of stone on north side of west abutment of small bridge, 240 feet west of milepost 16	1,392.14
Jackson Summit; copper tablet in north face of foundation near northeast corner of residence of O. B. Morrill, nearly opposite Erie station, marked "1585 HARRISBURG 1899"	1,585.280
Somers Lane, ¼ mile north of; large nail in root of sugar maple, 70 feet west of track	1,000.67
Lawrenceville, 1 mile south of; on top of stone at west end of north abutment of small bridge, 400 feet south of milepost 2	998.67
Lawrenceville; on top of stone at south end of east abutment of highway bridge over Tioga River, near railroad station	992.63
Lawrenceville, ¾ mile north of station; on corner of stone on east side of north abutment of small bridge, 140 feet south of milepost 99–92	986.14
Lindley, ¾ mile south of; on point of ledge nearly opposite milepost 100–71	986.93
Lindley, ¼ mile north of; bolt in telegraph pole nearly opposite milepost 101–70	981.09
Lindley, 1¼ miles north of; on top of bridge-seat stone on west side of south abutment of iron bridge at milepost 102–69	979.84
Lindley, 2¼ miles north of; on top of coping stone at west end of south abutment of small bridge, 840 feet south of milepost 103–68	972.19
Presho, ¾ mile south of; on top of stone at east end of south abutment of steel bridge, 630 feet south of milepost 104–67	962.97

	Feet.
Presho; on top of bridge-seat stone on west side of south abutment of double-track steel bridge, 700 feet south of railroad station	961.61
Presho, 1¼ miles north of; on west side of north abutment of small bridge.	952.92
Mulhollon; on top of third step on east side of south abutment of small bridge, 620 feet south of highway crossing near platform	954.99
Corning, 4 miles southwest of; railroad spike in stump 10 feet to left of track and 30 feet north of milepost 109–62	945.01
Corning, 2½ miles west of; on top of stone on south side of west abutment of small bridge 400 feet west of "Yard limit" sign	934.32
Corning; aluminum tablet on right side of Cedar street entrance to city hall, marked "935 D 1898"	935.969′

PENNSYLVANIA.

ERIE AND CRAWFORD COUNTIES.

Erie and Girard Quadrangles.

The elevations in the following list are based on an aluminum tablet placed in the Soldiers' Home at Erie, Pennsylvania. The height of this bench is derived from a United States Army Engineers' bench mark, consisting of a chisel mark in the southwest corner of the foundation of the light-house keeper's dwelling at Erie. This elevation is accepted as 577.145 feet above mean sea level, as reduced in accordance with note on page 298 of Appendix to Twentieth Annual Report of this Survey.

The leveling was done under the general direction of Mr. Frank Sutton, topographer, by William Crennell, levelman.

All bench marks dependent on this datum are marked with the letters "ERIE," in addition to their figures of elevation.

GODARD TO ERIE, OVER HIGHWAY AND LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY, VIA FAIRVIEW.

	Feet.
Erie, chisel mark on southwest corner foundation of light-house keeper's dwelling	577.145
Godard road, 200 feet west of Mr. Hull's house, opposite old barn, highest point of bowlder, north side of road	1,326.56
Godard road, 300 feet north of; northwest corner of large stone slab, west side of road, front of large brick house	1,392.18
Five Points, spike on root of elm tree at intersection of roads, front of brick schoolhouse No. 9	1,327.26
Five Points, west end of culvert of road running south, at intersection of roads	1,277.70
Erie and Five Points, southwest corner of roads to; three spikes driven in guy pole of telephone line	1,070.59
McKean, 1¼ miles north of; on Erie highway, west end of south abutment of bridge over Elk Creek	1,032.47
McKean, Bowman's Hotel, large bowlder northwest corner of well front of	1,051.17
Elk Creek, paint mark on south end of west abutment of bridge over creek, 350 feet west of brick house	963.33

	Feet.
Sterrettannia, Cook's flour mill at; aluminum tablet set in southeast corner of foundation of, marked "ERIE 904"	904. 86
Sterrettannia, 2,000 feet west of road from; smooth-bark hickory tree south side of road	974. 02
Fairview, 1.5 miles south of; northeast corner of south abutment of bridge.	850. 74
Fairview, aluminum tablet in southwest corner of foundation of store owned by David Yeagle, marked "ERIE 795"	795. 837
Fairview, ½ mile north of; spike in north post, east side of road, guard fence over ravine	750. 11
Fairview, 0.8 mile east of; chisel mark in stone foot of smooth-bark hickory tree across road from George S. Stone's grocery	711. 02
Fairview, 2.6 miles east of; spike in top of west post of section stand south side of tracks at milepost 97	738. 38
Fairview, 4.6 miles east of; spike in top of west post of section stand south side of tracks at milepost 95	738. 93
Fairview, 5.2 miles east of; Church road crossing, spike in top of telephone stump north side of tracks, 1,000 feet west of	731. 31
Fairview, 7.6 miles east of; spike in top of east post of [section stand by milepost 92	723. 24
Fairview, 9.6 miles east of; spike in top of east post of section stand by milepost 90	713. 49
Erie, Cascade street; spike in top of east post of section stand	702. 03
Erie, Soldiers' Home; spike in timber bridge seat southwest corner of bridge over Pennsylvania Railroad in rear of	629. 64
Erie, Soldiers' Home; aluminum tablet in water table northwest corner of hospital wing of, marked "ERIE 635"	635. 640
Erie, Soldiers' Home; spike in spile southwest corner of boathouse basin at	575. 03

FAIRVIEW, OVER LAKE SHORE AND MICHIGAN SOUTHERN RAILWAY, TO STATE LINE, VIA GIRARD.

Fairview station, George S. Stone's grocery at; chisel cut in stone at foot of smooth-bark hickory tree across road from	711. 02
Fairview, 1.3 miles west of; spike in top of east post of section stand at milepost 100	715. 20
Fairview, first crossing west of; spike in top of stump west side of road north of track sat	708. 15
Fairview, 2.3 miles west of; spike in top of east post of section stand at milepost 101	710. 32
Fairview, 3.3 miles west of; spike in top of east post of section stand at milepost 102	718. 59
Fairview, 4.3 miles west of; spike in top of east post of section stand at milepost 103	721. 77
Fairview, 5.3 miles west of; spike in top of east post of section stand at milepost 104	716. 26
Girard Junction, 600 feet west of road crossing at; spike in top of east post of section stand 105 miles west of Buffalo	705. 23
Girard Junction, 1 mile west of; spike in top of east post of section stand at milepost 106	693. 15
Girard Junction, 2 miles west of; spike in top of east post of section stand at milepost 107	679. 11
Girard Junction, 4 miles west of; spike in top of east post of section stand at milepost 109	660. 31

	Feet.
Girard Junction, 5 miles west of; spike in top of east post of section stand at milepost 110	660. 52
Girard Junction, 6 miles west of; spike in top of east post of section stand at milepost 111	655. 22
Girard Junction, 6½ miles west of; bench mark, southeast corner of coping west abutment of culvert under Lake Shore and Michigan Southern Railway at crossing, marked "Br. # 8."	649. 28
Girard Junction, 8 miles west of; spike in top of east post of section stand at milepost 113	657. 87
Girard Junction, 8.4 miles west of; State Line crossing; chisel mark on stone of culvert north of tracks and east of road	649. 45
State Line monument (Pennsylvania and Ohio), 1¼ miles north of Lake Shore and Michigan Southern Railway; aluminum tablet on south side of pedestal of; marked "ERIE 635"	635. 149

STATE LINE, OVER HIGHWAY, VIA TRACY, CONNEAUTVILLE AND PONT, TO GIRARD.

State line on Ridge road, ½ mile east of; bench mark on northeast corner of north abutment of culvert at	678. 83
West Springfield, aluminum tablet in the foundation west side of A. J. Thomas's barn, marked "ERIE 712"	712. 326
Five Points, spike in stump east of road and 50 feet north of cherry tree, 350 feet north of white house	820. 70
Conneaut Creek, spike in root of maple tree west side of road, 200 feet north of old house	872. 87
Tracy, 1 mile south of; top of iron hitching post front of Mr. Culbertson's house	955. 70
Tracy, 1 mile south of and just south of creek bridge; aluminum tablet in the northwest corner of foundation of house owned by Mr. Culbertson, marked "ERIE 952"	952. 674
Beaver Center, ½ mile north of; on bolt northeast corner of creek bridge	1, 000. 56
Beaver Center, store owned by L. L. Fuller, aluminum tablet in northeast corner of foundation of; marked "ERIE 1029"	1, 029. 870
Beaver Center, 0.4 mile south of; spike in southeast corner of bridge over run	1, 042. 27
Beaver Center, 0.7 mile south of; bench mark paint mark on stone southwest wing of bridge, 200 feet east of corner	1, 049. 75
Beaver Center, 1.9 miles south of; spike in root of chestnut tree front of old barn with red doors	1, 088. 14
Conneautville, spike in root of poplar tree north side of road 1,500 feet west of corner	1, 071. 22
Conneautville, spike in root of elm tree 150 feet west of road on fence line just before turn to south to	980. 96
Conneautville, 0.5 mile north of; on northeast corner of east abutment of bridge over Conneaut Creek	931. 33
Conneautville, aluminum tablet in southeast corner of foundation of bank building at; marked "ERIE 948"	948. 696
Conneautville, 1.8 miles east of; spike in root of maple tree south side of road, 400 feet west of barn	1, 235. 98
Conneautville, 2 miles east of; bench mark northwest corner masonry culvert under road	1, 236. 44
Conneautville, 3.3 miles east of; spike in log under rail fence 500 feet east of barn, north side of road	1, 209. 74

	Feet.
Hickernells, bronze tablet on nothwest corner of foundation of post-office at, marked "ERIE 1127"	1,127.688
Hickernells, 1.0 mile north of; on large bowlder northeast end of bridge over ditch 300 feet south of house, east side of road, in maple grove	1,166.69
Hickernells, 2.3 miles north of; spike in root north side of maple tree west side of road, 100 feet north of barn	1,171.58
Pont, spike in west end of timber bridge seat north side of bridge over first creek	1,074.56
Pont, bronze tablet in the front foundation of the United Brethren church at, marked "ERIE 1090"	1,090.253
Pont, 1.3 miles north of; spike in plank southwest corner of bridge flooring	1,007.99
Pont; 2.0 miles north of; bench-mark spike in hickory stump west side of road, 1,200 feet north of crossroad	1,012.73
Wellsburg, top of large bowlder northwest corner of creek bridge	940.98
Wellsburg, spike in apple-tree stump west side of road and 200 feet north of the Baptist church at	941.76
Cranesville, spike in root east side of maple tree 50 feet east of post-office at	937.20
Cranesville, spike in northeast corner of south abutment bridge No. 107	903.77
Platea, top of stone milepost 21	886.54
Platea, bronze tablet in southwest corner of foundation of the Methodist church at, marked "ERIE 876"	875.954
Girard, spike in northeast corner of timber bridge seat, north abutment of Pittsburg, Bessemer and Lake Erie Railroad bridge No. 108	830.86
Girard, top of stone milepost Pittsburg, Bessemer and Lake Erie Railroad, No. 19	792.23
Girard, southeast corner of coping of south abutment of bridge over Elk Creek, Pittsburg, Bessemer and Lake Erie Railroad, at	753.02
Girard, southeast corner of crosswalk slab over gutter north side of Main street, 100 feet east of railroad	770.82
Girard, Dobler's farm, northwest corner of stone flag foundation of fountain and watering trough	798.77

FAYETTE COUNTY.

MASONTOWN AND UNIONTOWN QUADRANGLES.

The following elevations are based on an aluminum tablet placed in Seventh Avenue Hotel, Pittsburg, the elevation of which is accepted as 738.527 feet above mean sea level. (See p. 420.)

The leveling was done under the general direction of Mr. Frank Sutton, topographer, by William Crennell, levelman. All bench marks dependent upon this datum are marked with the letters "PITTSBURG," in addition to their figures of elevation.

UNIONTOWN TO FARMINGTON.

	Feet.
Uniontown; highest point of stone post southwest corner of Broadway and Penn street	975.62
Uniontown; intersection of National Pike with Fayette street, center of waterworks cover	1,058.08
Uniontown, 1 mile south of; chisel mark on ledge west side of National Pike, top of hill	1,101.17

	Feet.
Uniontown, 1.5 miles south of; on second course of masonry guard wall over creek, east side of National Pike	1,015.14
Uniontown, 2.4 miles south of; on bowlder west side of National Pike, center of driveway south of blacksmith's shop	1,136.41
Uniontown, 3.6 miles south of; spike in top of cut-off telegraph pole north side of National Pike, 800 feet west of Turkey's Nest	1,478.28
Uniontown, 4.4 miles south of; spike in walnut stump south side of National Pike, 3,000 feet south of white house	1,782.70
Summit, 1,500 feet west of; on bowlder north side of National Pike	2,245.58
Summit, 75 feet east of steps in front of Summit House, bronze tablet in large bowlder in field south side of National Pike, 20 feet south of fence marked "2418 PITTSBURG"	2,417.673
Summit, road running south at; highest point of bowlder at intersection of National Pike with	2,412.97
Summit, 1.1 miles south of; on northeast corner of south masonry wall on National Pike over creek, foot of hill	1,947.69
Chalk Hill; highest point on large stone at telegraph pole front of Chalk Hill grocery	2,071.67
Chalk Hill, 0.5 mile south of; highest point of bowlder north side of National Pike, 700 feet west of stone house	1,930.87
Braddock's grave, 1.4 miles south of; on southwest corner of north abutment wall on National Pike over creek	1,904.94
Fort Necessity, 10.7 miles south of Uniontown; on stone 20 feet west of water trough, north side of National Pike, 150 feet west of brick house at.	1,951.37
Fort Necessity, ½ mile east of; on southeast corner of north abutment wall over creek on National Pike	1,938.33
Fort Necessity, 1.1 miles south of; highest point of bowlder southwest fence corner of road at Rackett's store and National Pike, point 4 inches from fence	1,897.11

FARMINGTON TO ELLIOTTSVILLE.

Farmington, 0.3 mile south of; highest point of bowlder east side of road at large tree	1,902.52
Farmington, 1.9 miles south of; spike in root of maple tree west side of road, 125 feet south of small barn on east side of road	1,740.76
Farmington, 4.7 miles south of; on bowlder west side of road, 10 feet north of creek	1,603.91
Elliottsville, bronze tablet in north side of east abutment wing wall of stone arch bridge over Sandy Creek at, marked "1569 PITTSBURG"	1,569.211

FARMINGTON, VIA OHIO PYLE, INDIAN CREEK, DUNBAR, AND LEMONT, TO UNIONTOWN.

Farmington, bronze tablet in southwest corner of foundation of Thomas Rush's hotel, marked "1835 PITTSBURG"	1,835.412
Farmington, 1.2 miles north of; highest point of bowlder in fence corner east side of road, 50 feet south of butternut tree	1,836.94
Farmington, 4.1 miles north of; on bowlder west side of road, at schoolhouse	1,819.26
Farmington, 5.4 miles north of; highest point of bowlder west side of road at turn	1,620.33
Ohio Pyle, Youghiogheny River at; bronze tablet in south face of north abutment pier of bridge over, marked "1218 PITTSBURG"	1,217.798
Stewarton, on bowlder west side of tracks, 500 feet west of	1,079.47

	Feet.
Indian Creek, bronze tablet on south bridge seat, west abutment, of Baltimore and Ohio Railroad bridge over Indian Creek, marked "970 PITTSBURG"	970.517
Connellsville, 1 mile south of; chisel mark on northwest corner of north abutment of bridge over Youghiogheny River (Baltimore and Ohio Short Line)	914.28
Dunbar, 2.2 miles east of; on northwest corner of east abutment of railroad bridge over Dunbar Creek	941.82
Dunbar; bronze tablet in water table northeast corner of George Swearingen's store, marked "998 PITTSBURG"	998.55
Ferguson's flag station, ¼ mile north of; chisel mark on west side of north abutment of bridge over creek	1,110.33
Lemont; bronze tablet in water table northeast corner of Union Supply Company's store, marked "1059 PITTSBURG"	1,059.162
Lemont, 1 mile south of; chisel mark on southeast corner of south abutment of bridge over creek (Pennsylvania Railroad)	991.90

BROWNSVILLE TO JACOBS FERRY.

West Brownsville Junction, ½ mile south of; bronze tablet in bridge seat at east end of north abutment of Pennsylvania Railroad bridge over Monongahela River, marked "778 PITTSBURG 1899"	777.666
Brownsville, 0.7 mile south of; spike in top of post west side of bridge at corner of alley, 150 feet north of bridge	770.78
Brownsville, on highest point of half of millstone southeast corner of Bridge and Bank streets, in front of Bar House	777.73
Brownsville, 2.9 miles south of; chisel mark on bowlder west side of road, 50 feet south of run	798.15
Brownsville, 3.9 miles south of; chisel mark on west end of bridge seat, south abutment of bridge over run on Run road	761.39
Brownsville, 4.5 miles south of; chisel mark on bowlder east side of road at forks, road running up hill to right	847.40
Brownsville, 5.3 miles south of; chisel mark on ledge east side of road just north of spring	971.17
Brownsville, 5.9 miles south of; chisel mark on bowlder right side of road at turn by large oak tree	994.48
Brownsville, 7.8 miles south of; chisel mark on bowlder at intersection of roads near river	790.32
Jacobs Ferry; bronze tablet in southwest corner of foundation of East Riverside Mills, marked "792 PITTSBURG"	792.449

POINT MARION TO GREENSBORO.

Point Marion; bronze tablet in coping stone at east end of north pier of 6-span truss girder bridge of Baltimore and Ohio Railroad over Cheat River, marked "813 PITTSBURG 1899"	812.911
Point Marion, 0.4 mile north of; river crossing, chisel mark on stone west ferry landing	785.97
Point Marion, 1.6 miles north of; chisel mark on stone at turn to left between old barn and house	827.67
Point Marion, 2.5 miles north of; chisel mark on bowlder west side of road opposite old barn just north of turn	814.44
Point Marion, 3.1 miles north of; chisel mark on stone west side of south abutment of bridge over Dunkard Creek	799.95

	Feet.
Point Marion, 4.2 miles north of; chisel mark on stone east side of road 200 feet north of white house on west side of road	823.75
Geneva, over creek across from; chisel mark on west side of north abutment of bridge	793.43
Greensboro; bronze tablet on southeast corner of foundation of Crawford's Block, marked "806 PITTSBURG"	806.483

MARYLAND—PENNSYLVANIA.

HARFORD COUNTY, MARYLAND, LANCASTER AND CHESTER COUNTIES, PENNSYLVANIA.

Havre de Grace Quadrangle.

The following elevations are based on an aluminum tablet, placed in the city hall at Baltimore, Maryland, the elevation of which is accepted as 19.970 feet above mean sea level.

The leveling was done under the general direction of Mr. W. Carvel Hall, topographer, by Mr. C. M. Smith, levelman.

All bench marks dependent on this datum are marked with the letters "BALTO," in addition to their figures of elevation, thus referring them to Baltimore as a datum:

	Feet.
Baltimore; Baltimore Union Railroad tunnel, shelf, north end, west side (Philadelphia, Wilmington and Baltimore Railroad bench mark)	92.21
Baltimore, aluminum tablet at Holliday street entrance to city hall, marked "MARYLAND 21 BALTO"	19.970

ABERDEEN, VIA CARSINS RUN AND DARLINGTON, TO CONOWINGO.

Aberdeen; copper bolt at east end of box culvert at milepost 65 (Philadelphia, Wilmington and Baltimore Railroad bench mark No. 62)	66.86
Aberdeen; aluminum tablet set in upper foundation stone of First National Bank of Aberdeen, southeast corner, marked "MARYLAND 79 BALTO"	79.367
Aberdeen, 1 mile north of; bench mark on locust tree 18 inches diameter east side of road and 18 feet southwest of corner of store kept by H. O. Ford, marked "145" on tree	144.65
Carsins Run, ¾ mile northeast of; bench mark on small white oak tree on north side of road and 100 feet east of road leading northwest, marked "343" on tree	343.14
Aldino post-office, 0.3 mile southwest of; bench mark on locust tree in front of E. Armstrong's house, marked "400" on tree	400.09
Aldino, 1 mile northeast of; bench mark on sycamore tree at a spring near house owned by Mr. Sheridan, marked "368" on tree	368.08
Level post-office, ¼ mile southeast of; bench mark on oak tree 4 feet diameter at southeast corner intersection with cross-road running northwest and southeast, marked "393" on tree	392.63
Level, 1¼ miles of; along road to Darlington, bench mark on cedar tree 1½ feet diameter at southeast corner junction with road leading east, marked "323" on tree	322.63
Darlington, 3 miles south of; bronze tablet set in east foundation stone east side of Prospect schoolhouse, marked "MARYLAND 345 BALTO"	345.573

	Feet.
Darlington, 2½ miles south of; bench mark on walnut tree 3 feet diameter at junction with road running northwest in front of Harmony Church, marked "221" on tree	221.114
Darlington, 0.4 mile north of; bench mark on stone at southeast corner of junction with road running east to Berkleyville and Conowingo, marked "333" on stone	333.48
Glen Cove, bench mark on ledge of rock at northwest corner of road, at foot of stairs leading up to office over old lime-kilns, marked "58" on rock	58.51
Conowingo; copper bolt southwest bridge seat of county bridge (Philadelphia, Wilmington and Baltimore Railroad bench mark No. 11)	68.86
Conowingo; aluminum plate set in foundation stone 2 feet from ground in northwest corner of post-office at Conowingo, marked "MARYLAND 76 BALTO"	76.694

CONOWINGO VIA RISING SUN AND PRINCIPIO POST-OFFICE TO ZION.

	Feet.
Conowingo, 1½ miles east of; bench mark on chestnut tree 6½ feet in diameter, south side of road, 300 feet east of colored school at Mount Zion, marked "389" on tree	389.26
Conowingo, 2½ miles east of; bench mark on hickory tree 1½ feet in diameter, south side of road, about 250 feet west of where telephone line leaves the field and joins road, marked "304" on tree	304.25
Porter's bridge (Richardmere post-office), 2½ miles west of; bench mark on oak tree, 3 feet diameter, south side of road and 55 feet west of junction with road leading south, marked "172" on tree	172.44
Porter's bridge (Richardmere post-office); aluminum tablet in foundation stone 3 feet from ground, in southwest corner of J. W. Richard's mill, marked "MARYLAND 89 BALTO"	88.687
Porter's bridge, 1 mile east of; bench mark on celebrated white oak, 7 feet in diameter, in center of road, marked "284" on tree	283.82
Rising Sun; aluminum tablet in foundation stone, 1 foot above ground, in north side Worthington's store, marked "MARYLAND 387 BALTO"	386.925
Rising Sun, 1 mile south of; bench mark on maple tree, 2½ feet in diameter, west side of road and 50 feet southeast of C. Kimble's house, marked "447" on tree	447.51
Principio; copper bolt in door sill of station (Philadelphia, Wilmington and Baltimore Railroad bench mark No. 53)	66.76
Zion; bench mark on locust tree southeast corner crossroads, at northwest corner of store	389.06

PRINCIPIO POST-OFFICE TO PORT DEPOSIT.

	Feet.
Port Deposit, ¼ mile north of; bench mark on rock east side of road, marked "104" on rock	104.09
Port Deposit; aluminum tablet set in northwest corner foundation stone of Port Deposit post-office and town hall building, marked "MARYLAND 16 BALTO"	15.861
Post Deposit, 0.9 miles south of (Pennsylvania Railroad bench mark No. 3, Columbia and Port Deposit Branch); copper bolt on northeast bridge seat of bridge No. 27	5.06

BATTLE SWAMP VIA PRINCIPIO POST-OFFICE AND PRINCIPIO FURNACE TO HAVRE DE GRACE.

	Feet.
Battle Swamp; bench mark on root of small maple tree opposite drug store, marked "465" on tree	464.60
Battle Swamp, 1½ miles northeast of; bench mark on white oak tree, 4 feet in diameter, at intersection with road leading southeast, in front of Hopewell Methodist Episcopal Church, marked "406" on tree	405.98
Principio post-office, 0.9 mile northwest of; intersection with road running north, bench mark on locust tree, 18 inches in diameter, at northeast corner of roads, marked "428" on tree	428.043
Principio post-office; aluminum tablet set in southwest corner foundation stone of H. R. Lynch's store, 2½ feet from ground, marked "MARYLAND 302 BALTO"	301.867
Principio post-office, 0.6 mile south of; bench mark on white stone, west side of road, at entrance to J. H. Maxwell's house, marked "302" on stone and fence	301.84
Blythesdale, 2¾ miles north of; bench mark on poplar tree 3 feet in diameter, east side of road, near spring, marked on tree "302"	301.45
Blythesdale, 1.1 miles north of; bench mark on root of chestnut tree 8 inches in diameter, west side of road, at edge of woods, marked "424" on tree	423.73
Blythesdale, southeast corner of roads at; bench mark on root of locust tree 2½ feet in diameter, about 20 feet from small red house, marked "284" on tree	284.067
Whittaker's mill, 500 feet southwest of large rock in field; point on top, marked "227" on rock	226.47
Principio Furnace post-office, 0.7 mile west of; stone monument east side of road, at southwest corner of property owned by W. H. Currier, marked "211" on fence post at monument	211.43
Principio station, 0.7 mile west of; junction with road running northwest, bench mark on root of oak tree, 2½ feet diameter, at northeast corner of, about 10 feet from small red house	109.97
Principio station, Philadelphia, Wilmington and Baltimore Railroad; copper bolt in doorsill, railroad bench mark No. 53	66.760
Havre de Grace; copper bolt No. 57 in southwest back wall of Susquehanna River bridge (Philadelphia, Wilmington and Baltimore Railroad bench mark)	28.22
Havre de Grace; aluminum tablet in southwest corner of Philadelphia, Wilmington and Baltimore Railroad station at Havre de Grace, Maryland, about 8 feet above tracks, marked "MARYLAND 35 BALTO"	35.090

MARYLAND—PENNSYLVANIA—WEST VIRGINIA.

WASHINGTON COUNTY, MARYLAND, FRANKLIN COUNTY, PENNSYLVANIA, AND MORGAN COUNTY, WEST VIRGINIA.

HANCOCK AND PAWPAW QUADRANGLES.

The elevations in the following list are based on a bronze tablet placed in the Allegany County court-house at Cumberland, Maryland, the elevation of which is accepted as 687.627 feet above mean sea level. (See page 363, Appendix to Twentieth Annual Report.)

The leveling was done, under the general direction of Mr. W. Carvel Hall, topographer, by Messrs. Charles M. Smith and C. B. Bailey, levelmen.

All bench marks dependent on this datum are marked with the letter C in addition to their figures of elevation.

HEDGESVILLE TO TOMAHAWK.

	Feet.
Hedgesville, 1½ miles west of; bench mark on oak tree north side of road, marked "493"	492.92
Tomahawk, 1 mile north of; bench mark on gum tree, 1 foot diameter, east side of road, marked "542"	542.42
Tomahawk; aluminum tablet set in northeast corner foundation stone of W. W. Hedge's barn, marked "MARYLAND 466 C"	466.424

CLEAR SPRING, ALONG CANAL, AND COONS RIDGE TO SYLVAN.

McCoy's ferry; bench mark on sycamore tree 1½ feet in diameter, on towpath Chesapeake and Ohio Canal, marked "407" on tree	406.78
Cherry Run, West Virginia, 1 mile east of; bench mark on spike on east end of crossbeam supporting bent to stairway over towpath and canal, at the east end of Big Pool, at the stop gate, marked "U. S. G. S., B. M. 406" on bent	405.84
Cherry Run, West Virginia, 1½ miles west of; aluminum tablet set in south side of the southwest corner wing wall of Chesapeake and Ohio Canal viaduct over Licking Creek, 4 feet from west end of wall and about 2 feet below coping, in the second tier of masonry under coping, marked "MARYLAND 402 C"	401.932
Pecktonville, Maryland; bench mark on oak tree 2½ feet in diameter, north side of road, marked "405" on tree	404.69
Pecktonville, 1¼ miles north of; bench mark on oak tree 2½ feet in diameter, west side of road, on brow of first hill after crossing Licking Creek, marked "594" on tree	594.44
Pecktonville, 3¼ miles north of; bench mark on oak tree 2 feet in diameter, at northwest corner, intersection with cross trail running east and west, marked "691" on tree	691.12
Sylvan, Pennsylvania, 1½ miles south of; aluminum tablet set in foundation stone in south side of Yeakle's mill, near southwest corner and 5 feet above ground, marked "MARYLAND 407 C"	466.682

GREAT CACAPON, VIA LONG HOLLOW RUN, TO FISHER FORD.

Great Cacapon, United States Coast Survey bench mark on lock of dam No. 6	443.865
Great Cacapon, 2½ miles south of; bench mark on oak tree 2 feet in diameter at southwest corner of junction with road leading west to Orleans, marked "550" on tree	549.77
Great Cacapon, 6½ miles south of; bench mark on pine tree west side of road, marked "636" on tree	635.80
Fishers Ford, aluminum tablet set in large bowlder southeast corner road, marked "MARYLAND 543 C"	543.242

WEST VIRGINIA.

KANAWHA, CLAY, NICHOLAS, FAYETTE, AND GREENBRIER COUNTIES.

KANAWHA FALLS AND NICHOLAS QUADRANGLES.

The following elevations are based on a bronze tablet set in Lock No. 2, Kanawha River, marked "614 KNWA.," the elevation of which is accepted as 614.205 feet above mean sea level. This elevation is based on a United States Engineer's bench mark, also set in lock No. 2.

The leveling was done under the general direction of Mr. Albert Pike, topographer, by Mr. Hargraves Wood, levelman.

All bench marks dependent on this datum are marked with the letters "KNWA," in addition to their figures of elevation.

LOCK NO. 2, KANAWHA RIVER, EAST ON KANAWHA AND MICHIGAN RAILWAY TO GAULEY BRIDGE, THENCE ON CHESAPEAKE AND OHIO RAILWAY UP GAULEY RIVER VIA BELVA TO ZELA.

	Feet.
Kanawha River, Lock No. 2, near north end and in east face of masonry; bronze tablet, marked "614 KNWA"	614.205
Harewood, 600 feet east of coal tipple; north end of culvert of Kanawha and Michigan Railway, in top of coping; aluminum plug, marked "638 KNWA"	637.928
Kanawha Falls, 180 feet south of flag station of Kanawha and Michigan Railway and 200 feet north of road crossing of railroad, on west side of Kanawha and Michigan Railway, nearly opposite house of T. W. Farley; in face of rock at base of cliff; bronze tablet, marked "667 KNWA".	667.121
Gauley Bridge station, on Toledo and Ohio Central Railway, at west end of bridge over highway, in south face of abutment at top step of wing wall; aluminum tablet, marked "677 Kanawha"	677.086
Belva, Nicholas road station; at Chesapeake and Ohio Railway bridge over Gauley River, in south abutment of south face; bronze tablet, marked "711 KNWA"	710.506
Belva, 4.8 miles east of, also ½ mile northeast of mouth of Elk Creek, 15 feet northwest of road; aluminum plug in ledge of rock, marked "752 KNWA"	751.806
Lockwood, 0.1 mile west of; on north side of road opposite L. N. Simm's house; 200 feet east of R. L. Dickson's house, at east foot of Summers Hill; in ledge of rock on north side of road; bronze tablet, marked "1088 KNWA"	1,087.625
Lockwood, ¾ mile east of; at top of hill 100 feet east of church; stone at root of oak tree, marked "1260"	1,259.83
Winston, ¾ mile east of; 100 feet west of Jones Fork, on east side of church on north side of road; nail in root of small oak tree, marked "1180"	1,180.31
Zela, 0.1 mile east of and 300 feet west of Crosslanes road; in field 50 feet south; large sandstone rock in which aluminum tablet is placed, marked "1267 KNWA"	1,267.646

ZELA EAST ON PIKE TO SUMMERSVILLE.

	Feet.
Gilboa, 0.1 mile east of; rock on north side of road 100 feet west of McVines Branch, marked "1299"	1,298.54
Gilboa, 1.3 miles east of; 200 feet west of top of hill, on north side of road; nail in root of large chestnut tree, marked "1508"	1,508.23
Gilboa, 2.5 miles east of; on north side of road, opposite mill and road running south; nail in root of small white-oak tree, marked "1496"	1,496.24
Enon post-office, 1 mile east of; at crossing of Pine Run and northwest angle of road to Muddlety Creek; nail in root of sycamore tree, marked "1525"	1,525.05
Summersville; courthouse front; at east side of door in base of pilaster, aluminum tablet marked "1894 KNWA"	1,893.808

ZELA, VIA KESLERS CROSSLANES AND CARNIFAX FERRY, TO MOUNT LOOKOUT.

Zela, 3.3 miles south of; top of mountain, head of Whitewater Creek, north side of road; nail in root of white-oak tree, marked "1662"	1,661.80
Keslers Crosslanes, at store and crossroads 600 feet south of; 100 feet south of S. P. Campbell's house, on west side of road in ledge of rock; brass plug, marked "1567 KNWA"	1,567.409
Keslers Crosslanes, 1 mile south of; road running east and west; at northeast angle, nail in root of white-oak tree, bearing sign "To Summersville, 8 miles," marked "1553"	1,552.53
Kesslers Crosslanes, 2 miles south of; on east side of road, opposite settlement road; nail in root of black-ash tree, marked "1681"	1,680.900
Carnifax Ferry; south side of Gauley River, east side mouth of Meadow River, west side of road to Mount Lookout; nail in root of small white-birch tree, marked "1190"	1,189.77
Carnifax Ferry, 1.2 miles south of and 200 feet north of big cliff, on east side of road; nail in root of white-oak tree, marked "1503"	1,503.17
Carnifax Ferry, 2.2 miles south of; on east side of road, opposite house; nail in root of beech tree at gate, marked "1866"	1,866.32
Mount Lookout, at east side of road to Pool and north side of road to Summersville; spike in stump of large oak tree, marked "1964"	1,964.16
Mount Lookout, 1.1 miles southeast of; angle of road running southwest; nail in root of poplar tree, marked "2038"	2,037.12

MOUNT LOOKOUT, VIA POOL, TO FOWLERS KNOB.

Mount Lookout, 1.6 miles south of; schoolhouse 250 feet south of, on east side of road; small ledge of rock; aluminum plug in, marked "2069 KNWA"	2,069.402
Mount Lookout, 2.8 miles southeast of; road running south; stone at northwest corner, marked "2101" on stump	2,100.458
Pool, 0.1 mile north of; on east side of road; nail in chestnut, marked "2145"	2,145.40
Pool, 2.6 miles north of; road south to Russellville, at top of hill; nail in wood plug at base of signboard	2,394.24
Fowlers Knob, 400 feet south of; on east side of road, just north of small branch; aluminum plug in large ledge of rock, marked "2195 KNWA"	2,195.382
Fowlers Knob, 1 mile south of; opposite small house 0.2 mile north of Homing Falls road; nail in root of stump on east side of road, marked "2338"	2,338.29

FOWLERS KNOB, VIA ANGLINS CREEK BRIDGE AND MILLERS FERRY, TO RUSSELLVILLE.

	Feet.
Fowlers Knob, 2.5 miles south of; road running south, at southeast angle; nail in chestnut, marked "2215"	2,215.217
Fowlers Knob, 3.1 miles south of; road running west, at store at southwest angle; stone, marked "2208"	2,207.78
Fowlers Knob, 4 miles south of; 3 miles north of Anglins Creek bridge, opposite milldam on west side of road; nail in locust, marked "1923"	1,922.94
Fowlers Knob, 5.2 miles south of; about 1 mile north of Millers Ferry, top of mountain on east side of road; chestnut, marked "2307"	2,306.86
Millers Ferry over Meadow River, 0.1 mile north of; on east side of river on west side of road; aluminum plug in ledge of rock, marked "1905 KNWA"	1,904.943

RUSSELLVILLE, OVER MOUNTAIN, TO RIVERSIDE.

Russellville, 90 feet north of; on east side of road, west side of river; aluminum tablet in ledge of rock, marked "1900 KNWA"	1,900.123
Russellville, 3.7 miles south of; on east side of road between log house and frame house; nail in root of chestnut, marked "2721"	2,721.26
Russellville, 4.7 miles south of and 60 feet north of church; south side of road running south to Clifftop; nail in maple, marked "2782"	2,781.81
Russellville, 6.7 miles south of; top of mountain 300 feet north of schoolhouse; nail in tree on east side of road, marked "2982"	2,982.09
Riverside at Meadow River, 150 feet northwest of; ford 800 feet east of; on west side of road, between house and barn, one of several ledges of rock; aluminum plug in, marked "2324 KNWA"	2,324.014
Riverside, 2 miles east of; at fork of road, running northwest; nail in locust bearing sign "to Riverside 2 miles," "to Russellville 12," "to Clifftop 11," to Burdett's Mills 2½," marked "2723" on sign board	2,723.19

RIVERSIDE, ROAD NEAR BURDETT'S SCHOOLHOUSE, VIA BEAR GARDEN RIDGE, ON TRAIL AND OLD ROAD TO SNOWHILL.

Riverside, 3.8 miles east of; Burdett's schoolhouse, 1.4 miles east of; gap in ridge east of Bear Garden Knob; nail in chestnut, marked "3046"	3,045.59
Riverside, 5.3 miles east of; Burdett's schoolhouse, 2.9 miles northeast of, on Collison ridge, 1.2 miles east of Pittsenberger's house, white linden tree; marked "3154"	3,153.87
Nicholas road, 1.4 miles southwest of; at southwest corner old road and trail on Collison Ridge; large red oak tree, marked "3318"	3,318.35
Nicholas road, 0.6 mile southwest of; on south side old road on top of small knob; maple tree, marked "3405"	3,405.54
Snow Hill, 8.8 miles southeast of; at northwest intersection Nicholas road and road to Nuttersville; 500 feet north of Grig M. Clung's house; copper plate in large sandstone rock, marked "3392 KNWA"	3,391.855
Snow Hill, 6.9 miles southeast of; on west side of road; 1.1 miles north of trail running east to Beech Knob; maple tree, marked "3243"	3,243.58
Snow Hill, 6.5 miles southeast of; Greenbrier and Nicholas county line; corner stone top of; marked in red chalk "3129"	3,129.00
Snow Hill, 5.5 miles southeast of; Homing Falls road, 0.9 mile southeast of; on west side of road; chestnut tree, marked "3023"	3,023.43
Snow Hill, 4.4 miles southeast of; road running east to Homing Falls, at southeast angle of; white oak tree, marked "2806"	2,805.93

	Feet.
Snow Hill, 3.4 miles southeast of; road to Homing Falls 1 mile northwest; 700 feet northwest of house on east side of road; chestnut tree, marked "2899"	2,899.04
Snow Hill, 2.6 miles southeast of; opposite road running east; small chestnut tree, marked "2854"	2,853.78
Snow Hill, 2 miles southeast of; at fork of road running west; chestnut tree, bearing sign "to Russellville, 12 miles;" "to Ruperts, 16 miles;" marked "2940"	2,940.44

SNOW HILL ON NICHOLAS ROAD TO FORK OF ROAD 1 MILE SOUTHEAST OF FOWLERS KNOB.

Snow Hill post-office, 200 feet southwest of; 535 feet north of road running west on west side of Nicholas road; aluminum bolt in rock, marked "2943 KNWA" and "B.M., U. S. G. S." painted on rock	2,943.583
Snow Hill, 0.7 mile north of; at southeast angle road running east; chestnut bearing sign "to Homing Falls, 2 miles, to Rupert's, 18 miles;" marked on sign board "2850"	2,850.25
Snow Hill, 1.6 miles northwest of; northwest angle of road running north, 150 feet west of new schoolhouse and near sign "to Summersville, 15 miles;" chestnut tree, marked "2838"	2,838.13
Snow Hill, 2.6 miles northwest of; 850 feet west of Jones's house on north side of road; nail in root of stump, marked "2606"	2,605.76
Snow Hill, 3.3 miles northwest of; southeast angle of road running southwest; small black oak tree bearing sign "to Summersville, 13 miles," "to Eyes Mill, 2 miles"	2,492.67
Snow Hill, 5.2 miles northwest of; at southeast angle of road running east; at deserted store; chestnut, marked "2434"	2,434.28

SNOW HILL 1.6 MILES NORTHWEST OF; TOWARD OPHELIA.

Snow Hill, 1.7 miles northwest of; top of hill north of new schoolhouse	2,838.13
Snow Hill, 2.6 miles northwest of; 1 mile north of new schoolhouse; Odd's store, southeast corner foundation stone of marked "2711"	2,711.47
Road running north, at southeast corner at sign, "to Summersville, 13 miles, to Irondorfs Mills, 1½ miles;" stone, marked on sign "2536"	2,536.37
Homing Creek, bridge over; west end of west retaining wall on north side of road; stone, marked "1840"	1,840.15
Homing Creek, 1.9 miles east of; 500 feet east of trail to Homing Falls, north side of road; chestnut tree, marked "2657"	2,656.93
Ophelia, ¾ mile south of; at crossroads to Leivasy and Summersville, near church; stone	2,623.84
Ophelia, ¾ mile south of; 1,500 feet west of crossroads and church, at west side of farm road, 50 feet north of Summersville road; bolt in rock, marked "KNWA 2587"	2,587.132

CROSSROADS ¾ MILE SOUTH OF OPHELIA TO LEIVASY.

Ophelia, 1.7 miles southeast of; at southeast angle of road running northeast; large poplar tree, marked "2721"	2,721.378
Ophelia, 2.4 miles southeast of; 100 feet southwest of road on east; on north side of road; maple tree, marked "2694"	2,694.49
Ophelia, 3.08 miles southeast of; road running north; chestnut tree, marked "2747" on stump	2,746.83

	Feet.
Ophelia, 0.4 mile south of; 300 feet north of road to Cherry river and church; east side road, marked "B.M." on rock	2,379.04
Leivasy; store opposite to stone at gate, marked "2358"	2,357.69
Leivasy post-office, ½ mile south of; at fork of road to Hominy Falls and Lile; at southeast angle, marked "B.M" on rock	2,368.86
Leivasy post-office, 1½ miles southeast of; at log schoolhouse at north side of road; stone marked "2406" on schoolhouse	2,405.81
Leivasy post-office, 2½ miles southeast of; trail 0.1 mile southeast of white oak tree, marked "2605" on south side of road	2,605.39
Leivasy, 4 miles southeast of; chestnut tree bearing sign "to Leivasy 4 miles; to Rupert's 20 miles;" point on rear of tree, marked "3004" on sign board	3,004.53

LEIVASY, VIA LILE, TO BEECH KNOB.

Lile, 0.8 mile west of; and Greenbrier and Nicholas county line, stone, 0.15 mile east of; about 600 feet west of store on southwest side road; chestnut, marked "3342"	3,342.29
Lile, 0.6 mile west of; 130 feet west of trail running south on south side of road; chestnut tree, marked "3319"	3,319.34
Lile, 0.95 mile east of; opposite road running east and on west side of road to Beech Knob; beech tree, marked "3500"	3,499.78
Lile, 1.6 miles east of; at road running west and 60 feet east of branch; dead maple tree, marked "3848"	3,848.19

BEECH KNOB, AT ROAD RUNNING WEST, TO DUO.

Beech Knob, 1.1 miles south of; near small branch, on west side of road; maple tree marked "3894"	3,393.97
Beech Knob, 2 miles south of; 40 feet south of Long Branch crossing on east side of road; beech tree, marked "3219"	3,219.20
Duo, ½ mile northwest of; fork of road to Rupert, 200 feet north of; 100 feet north of branch and 50 feet east of road, near small house, bolt in bowlder, marked "3206 KNWA"	3,206.454

BEECH KNOB AT ROAD RUNNING WEST ON BIG MOUNTAIN RIDGE SOUTHWEST TO M'CLUNG AND SNOW HILL ROAD.

Beech Knob, 1.3 miles southwest of; and 20 feet west of faint trail on south side of road; beech tree, marked "3783"	3,783

SUMMERSVILLE, UP MUDDLETY CREEK, TO HOOKERSVILLE.

Summersville, brickyard and house between at road east; west side of small bridge, nail in, marked "1888"	1,887.578
Summersville, road east; nail in fork of oak, marked "1938"	1,938.14
Summersville, farm road east of, at northeast angle; black oak, marked "1984"	1,984.06
Phillips Run, fork of road at and bridge over Muddlety; large pin-oak tree, marked "1836"	1,835.66
Muddlety post-office, ½ mile north of; school 50 feet north of, west side of road, at small stream, beech, marked "1861"	1,860.80
Muddlety post-office, road west to Clay Court-House, opposite to small crabapple tree, on east side of road, marked "1854;" also ½ mile north old Valley House	1,854.51

	Feet.
Hookersville, at road running east up Muddlety, at southeast angle; white-oak tree, marked "1856"	1,855.83
Hookersville, 200 feet west of road to Powell Mountain, at intersection road up Muddlety; aluminum tablet in rock in field, marked "1859 KNWA"	1,859.496

POINT 6 MILES NORTH OF SUMMERSVILLE TO BUFFALO, AT MOUTH OF DOG RUN.

Muddlety road, 1 mile west of; first house on Clay Court-House road, 150 feet north of; at cut-off trail, chestnut tree, marked "1925"	1,925.13
Pearson Branch; near top of mountain, at head of hollow, 200 feet south of trail to; on west side of road, stone marked "2360"	2,359.81
Birch Run, 30 feet north of, on east side of road; trail west at top of ridge, at top of last ascent before reaching Birch Run; chestnut tree, marked "2025"	2,025.35
Beech Run, at crossing north side of run and west side of road at end of foot log; small beech, marked "1636"	1,636.16
Beech Run, crossing about 2,000 feet north of; on south side of road opposite Liberty Bowl schoolhouse; aluminum tablet in large rock, marked "1747 KNWA"	1,746.593
Liberty Bowl schoolhouse, 0.7 mile north of; stream 600 feet north of, on east side of road at old road; gum tree, marked "1795"	1,795.50
Clay-Nicholas county line, on north side road; large oak tree, marked "1727"	1,726.95
Dog Run, or Clay; deserted store and road running northeast; large chestnut tree, marked "1710"	1,710.47
Enoch post-office, road to; 25 feet north of, on north side of road; large white-oak tree, marked "1483"	1,482.69
Dog Run, between second and third crossing, descending on east side of road, about 1 mile northwest of Enoch church; beech tree, marked "1117"	1,117.46
Buffalo, northwest side of, and opposite point 60 feet north mouth of Dog Run; in Rock Cliff, aluminum tablet, marked "826 KNWA"	826.124

SUMMERSVILLE, OVER POWELL MOUNTAIN, TO BIRCH RIVER AND WELCH GLADE.

Hookersville, about 2½ miles north of; top of Powell Mountain, on south side of road; small iron-wood tree, marked "2484"	2,484.25
Hookersville, clearing about ½ mile north of, on east side of road; rock marked "2316"	2,316.15
Powell Mountain; road opposite to Strange Creek, on west side road to Sutton; aluminum bolt in small ledge of rock, marked "2249 KNWA"	2,249.18
Strange Creek, road ¾ mile north of; first crossing of branch about 100 feet south of, on west side of road; small beech tree, marked "1951"	1,950.89
Powell Mountain, foot of; ½ mile above; opposite house in bottom on west side road, small oak tree, marked "1363"	1,363.01
Powell Mountain, foot of; near schoolhouse on east side of road; small oak tree, marked "1224"	1,224.05
Birch Run post-office, about 300 feet north of; on east side Powell Creek, about ¼ mile north of mouth, and opposite Ivan Bros. and Brown's store; aluminum tablet in outcrop of rock, marked "1108 KNWA"	1,108,365
Birch River post-office, 1¼ miles east of; ¼ mile east of Anthony, opposite to church on south side of road; double sycamore tree, marked "1134"	1,134.15
Birch River, about 3 miles east of; at mouth of Rose Run, on north bank of the river; sycamore tree at foot log, marked "1196"	1,195.76

	Feet.
Skiles Branch, 250 feet east of mouth; poplar tree, marked "1253"	1,253.47
Birch River, about 6 miles east of; about ½ mile above Rich Fork, on southwest side road; beech tree near house, marked "1332"	1,331.75
Boggs post-office, 1¼ miles west of; at Roughs of Birch River, 150 feet east of falls and sawwill on south side of road; beech tree, marked "1495"	1,495.23
Boggs post-office, near; about 250 feet east of school, 20 feet north of road in outcrop of rock; bronze tablet, marked "1555 KNWA"	1,555.35
Boggs, 1 mile east of; near branch and opposite house on north side of road; stone in fence, marked "1589"	1,589.15
Boggs, about 3¼ miles east of; 500 feet above fourth house below foot of mountain on west side of road; birch tree, marked "1750"	1,750.37
Boggs, foot of mountain; about 1 mile below and at third crossing below same on east side of road; marked "1889"	1,888.53
Welch Glade, about 1 mile northwest of; 725 feet southeast of road from top of mountain to Cowen and Glade Run; about 500 feet southeast of house and ¼ mile northwest of church on east side of road; bronze tablet in rock, marked "2253 KNWA"	2,253.310
Welch Glade post-office, about 800 feet northwest of; nail in floor of bridge, marked "2223"	2,222.72
Welch Glade post-office, about 100 feet north of; railroad crossing between road to Camden and railroad; oak tree, marked "2222"	2,222.32

WELCH GLADE, VIA CAMDEN, TO CRAIGSVILLE.

Welch Glade, about 1¼ miles south of, on road to Camden; small beech tree 250 feet south of, and 50 feet north of road to sawmill site and on north side of road; small white-oak tree, marked "2275"	2,274.64
Camden on Gauley; at "The Camden," west side in pier to porch; bronze tablet, marked "2062 KNWA"	2,062.025
Camden on Gauley, 1 mile west of; roads to Craigsville and up Strouds Creek at southwest angle; oak tree, marked "2099"	2,098.81
Camden on Gauley, about 2 miles west of; foot log over Rock Camp Run; nail in east end of; marked "2170"	2,169.57
Craigsville, about 1¼ miles east of; bridge over Rock Camp Run; nail in west end of; marked "2203"	2,203.57
Craigsville, east end of point on tramway; nail in cross tie	2,282.52
Craigsville; at road to Cranberry at Hickman's store; small oak tree southwest angle of, marked "2293"	2,293.36
Craigsville, near east end of; 670 feet east of Cranberry road and hotel; on north side of road in front of Macon Bose's house; bronze tablet in rock, marked "2288 KNWA"	2,288.157

CRAIGSVILLE, UP BEAVER CREEK NEAR DELPHI, AND DOWN MUDDLETY CREEK TO HOOKERSVILLE.

Craigsville, west end of; west of tramroad and church; nail in stump of telegraph pole on north side of road	2,311.75
Craigsville, about ½ mile northwest of; at fork of road south to Beaver Mills on road southeast to Craigsville; near crossing of tramroad at southwest angle of roads; white-oak tree, marked "2337"	2,336.13
Craigsville, about 1½ miles northwest of; at top of mountain on west side of road; gum tree, marked "2435"	2,435.12
Craigsville, about 2¾ miles northwest of; at northeast angle of road east and west; small white-oak tree, marked "2196"	2,195.73

	Feet.
Delphi, about 1 mile south of; in Beaver bottom, near cross fence; wood plug	2, 199. 79
Delphi, 1½ miles west of; on north side of road opposite house; at foot of street; nail in root of stump, marked "2251"	2, 250. 62
Delphi, about 2¼ miles west of; on top of mountain, 500 feet west of house on south side of road; chestnut tree, marked "2504"	2, 503. 45
Hookersville, about 5 miles east of; 225 feet east of fork of Muddlety, at crossing of right fork, on north side of road west of crossing; aluminum tablet in large overhanging rock, marked "2005 KNWA"	2, 004. 842
Hookersville, about 4 miles east of; about 80 feet east of crossing of Muddlety, opposite cliffs on south side of road; water birch tree, marked "1939"	1, 938. 61
Hookersville, 2¼ miles east of; 200 feet east of schoolhouse at northeast angle of road to mill; oak tree, marked "1880"	1, 880. 41
Hookersville, 1½ miles east of; south of road between large house and cabin; large leaning maple tree, marked "1863"	1, 863. 15

CRAIGSVILLE VIA WOODBINE TO RICHWOOD.

Craigsville, point on tramway, east end of	2, 282. 52
Craigsville, 40 feet east of trail on south side of road; near broken down house; white oak tree, marked "2426"	2, 426. 06
Craigsville, sawmill site, trail to; on north side of road; rock, marked "2239"	2, 238. 87
Woodbine post-office, rear of; on west side of road; rock, marked "B.M.," with "1938" marked on blacksmith shop	1, 937. 65
Woodbine, 1 mile southeast of; opposite to Iron and Sulphur Springs and on east side of road; maple tree, marked "2522"	2, 521. 61
Woodbine, 2¼ miles southeast of; at northwest angle of trail west of Cherry River and near house; rock, marked "2849"	2, 848. 49
Woodbine, about 3 miles southeast of; 100 feet south of trail running east on southwest side of road; chestnut tree, marked "2914"	2, 914. 34
Woodbine, 4½ miles southeast of; at trail west; maple tree, marked "2969"	2, 967. 19
Woodbine, 4½ miles southeast of; on Greenbrier road at west side of, and on south side of trail running west, in hollow near maple tree, marked "2969;" bronze tablet in rock, marked "2969 KNWA"	2, 969. 33
Richwood, about 2¾ miles north of; 300 feet north of Pocahontas road on northeast side Greenbrier road near house; stump, marked "2972"	2, 971. 82
Richwood, about 2 miles north of; 90 feet south of church on west side of road; oak tree, marked "2976"	2, 975. 74
Richwood, about 1¾ miles north of; at beginning of descent at trail southwest and south of house on west side of road, chestnut tree, marked "2937"	2, 936. 88
Richwood, about ½ mile northeast of; 100 feet southwest of trail south, south side of road; rock, marked "2400"	2, 400. 05
Richwood, at Cherry River, north side of, on east side of road; walnut tree, marked "2189"	2, 188. 85

RICHWOOD VIA COLD KNOB AND JONES KNOB TO DUO.

Richwood, 1 mile south of, on east side of road; rock, marked "2589"	2, 588. 49
Richwood, 1¾ miles south of; top of Greenbrier-Nicholas county line; stone, marked "2874"	2, 874. 02

	Feet.
Richwood, about 2½ miles south of, at Little Laurel Creek bridge over west end and north side of; nail in floor, marked "2746"	2, 745. 97
Richwood, about 3½ miles south of, and about ½ mile north of Babies Hotel on east side of road, opposite to road running west; maple tree, marked "3195"	3, 194. 94
Richwood, about 6 miles south of, on south side of road to school; top of stump, marked "3713"	3, 712. 72
Richwood, 7¼ miles southeast of, on Manning Knob and east side of road; maple tree, marked "3912"	3, 912. 05
Richwood, about 7¾ miles southeast of, about 2,350 feet southeast of Manning Knob on northeast side of road; aluminum plug in large rock, marked "3709 KNWA" and "B.M." painted on rock; this bench mark is also 240 feet from foot of descent from Manning Knob going southeast	3, 709. 043
Richwood, 9 miles southeast of, about 1¾ miles southeast of Manning Knob and ¼ mile northwest of trail south; rock on east side of road, marked "3805" on larger rock	3, 804. 71
Richwood, 10 miles southeast of; about 2¾ miles southeast of Manning Knob on a level stretch of road where it runs east; on north side small beech tree, marked "3893"	3, 893. 32
Richwood, 11¾ miles southeast of; about 2 miles northwest of road to Duo and 1,000 feet south of cleared field on east side of road; maple tree, marked "3895"	3, 895. 29
Richwood, about 13 miles southeast of; about ¾ mile northwest of road to Duo at foot of climb going toward Cold Knob in clearing on east side of road; locust tree, marked "3795"	3, 795. 36
Richwood, about 13¾ miles southeast of; on southwest side of Greenbrier road; 795 feet northwest of road to Duo; aluminum tablet in rock, marked "4116 KNWA"	4, 116. 433
Duo, about 7¾ miles east of; about 300 feet east of summit of Grassy Knob, on south side of road; chestnut oak tree, marked "4347"	4, 346. 68
Duo, about 5½ miles east of; between Grassy Knob and Jobs Knob; about 200 feet west of house and 50 feet north of road; maple tree, marked "4015"	4, 014. 84
Duo, about 4½ miles east of; near top of Jobs Knob, on south side of road; large rock, marked "4252"	4, 252. 06
Duo, about 3½ miles east of; in gap between Jobs Knob and Shell Camp Ridge on south side of road; gum tree, marked "3955"	3, 955. 22
Duo, 1½ miles east of; on Shell Camp Ridge near spring and on south side of road; maple tree, marked "4014"	4, 013. 93
Duo; on center of bottom step on front porch of house, marked "3428"	3, 427. 55
Duo; check on bench mark plug in rock ½ mile northwest of Duo	3, 206. 454

LEIVASY NORTHEAST UP ROAD CROSSING GRASSY CREEK.

Leivasy; church at fork of road about ¼ mile north of; at top of hill; poor road; chestnut tree, marked "2494"	2, 494. 00
Grassy Creek crossing, about 900 feet east of; on north side of road up Grassy Creek; aluminum tablet in rock, marked "2426 KNWA"; bench mark painted on the rock	2, 425. 873

OHIO.

ROSS, VINTON, HOCKING, PICKAWAY, FAIRFIELD, FRANKLIN, AND LICKING COUNTIES.

WEST AND EAST CHILLICOTHE, CIRCLEVILLE, EAST AND WEST COLUMBUS QUADRANGLES.

The elevations in the following list are based on an aluminum tablet in Columbus court-house marked "778 COLUMBUS," the elevation of which is accepted as 777.595 feet above mean sea level. This height is derived from a line of precise levels run from the United States Coast and Geodetic Survey bench mark in Chillicothe.

The leveling was done under the general direction of Mr. Hersey Munroe, topographer, by Mr. W. F. Hammond, levelman.

All bench marks dependent on this datum are marked with the letters "COLUMBUS" in addition to their figures of elevation.

CHILLICOTHE TO COLUMBUS, VIA NORFOLK AND WESTERN RAILWAY.

	Feet.
Chillicothe; cut on the pedestal of the lamp-post on the north side of the steps of the front entrance of the court-house at, marked "Q.; B. M.; U. S. C. & G. S.; Aug. 5, 1879"	638.482
Chillicothe; bronze table set in wall at side of entrance to Chillicothe court-house, marked "644 COLUMBUS"	643.670
Chillicothe, 0.9 mile north of; on west end of coping southeast corner of north pier of highway bridge over Scioto River, marked with chisel	630.51
Chillicothe; surface of water in river	598.00
Chillicothe, 0.4 mile north of; chisel mark on northwest corner of stone stepstone	681.88
Chillicothe, 5.6 miles north of; bronze tablet set in bridge seat stone in southeast corner of bridge near crossroads, marked "691 COLUMBUS 1899".	691.283
Kinnikinnick; on footplate southeast corner of highway bridge, marked with chisel	668.09
Kingston, 1¾ miles south of; chisel mark on capstone east end of box culvert	721.14
Kingston, 1,000 feet south of; chisel mark on east end of culvert	784.44
Kingston, 1,000 feet north of; bronze tablet set in top stepstone of arch culvert, southwest corner, marked "774 COLUMBUS 1899"	774.00
Kingston, 1 mile north of; chisel mark on southwest corner of schoolhouse water table	784.10
Kingston, 2 miles north of; chisel mark on east wing of south abutment of highway bridge	718.45
Kingston, 5 miles north of; chisel mark on wall at end of drain 100 feet south of blacksmith shop	725.38
Circleville, 4 miles south of; bronze tablet set in north end of west abutment covered bridge over Sippo Creek, marked "707 COLUMBUS 1899"	706.822
Circleville, 2½ miles south of; chisel mark on top of bowlder at road corner	718.42
Circleville, ¾ mile southeast of; chisel mark cut in second step south wing, west abutment	693.12

	Feet.
Circleville; chisel mark cut in top of stone mile-post at corner of Main and Court streets	694.98
Circleville, 1½ miles north of; chisel mark on parapet wall west end of box culvert	695.88
Circleville, 2 miles north of; aluminum tablet set in south end of west parapet wall of box culvert marked "693 COLUMBUS 1899"	693.408
Circleville, 3½ miles north of; chisel mark on southeast wing of highway bridge	679.93
Ashville, ¼ mile south of; aluminum tablet set in top stepstone north wall east end of railway bridge over Big Walnut Creek, marked "696 COLUMBUS 1899"	696.382
Ashville, 1¼ miles north of; chisel mark on west end of 2-foot culvert pipe	705.59
Ashville, 2½ miles north of; railway spike driven in third telegraph pole north of highway	714.56
Duvalls; railway spike driven in first telegraph pole north of road	713.02
Lockbourne, 1½ miles south of; railway spike driven in first telegraph pole north of highway	717.04
Lockbourne; aluminum tablet set in top of south pier west end of Norfolk and Western Railway bridge over Ohio Canal, marked "716 COLUMBUS 1899"	715.793
Lockbourne, ½ mile west of; chisel mark on south wall of lock at west side of Big Walnut Creek	694.34
Lockbourne, 2 miles north of; chisel mark on second step of west wing north wall of turnpike bridge over canal, ½ mile south of Shadeville	702.75
Shadeville; chisel mark on east end of culvert near crossroad	708.27
Shadeville, 1½ miles north of; iron post set on Spangler Hill as triangulation point, 500 feet east of road, marked "817 COLUMBUS 1899"	816.803
Shadeville; chisel mark on corner stone in highway 500 feet west of Spangler's triangulation point	741.33
Columbus, 5½ miles south of; nail driven in cap of trestle at northwest corner of 10-foot bridge	693.19
Columbus, 4¼ miles south of; chisel mark on west parapet wall of box culvert	706.52
Columbus, 3½ miles south of; on south railing to stone steps at entrance of schoolhouse	726.74
Columbus, 3 miles south of; chisel mark on south end of east parapet wall of arch culvert	710.22
Columbus, corner of High street and Marion road; chisel mark on curb at southeast corner	748.76
Columbus, corner of High street and Dashler avenue; chisel mark on curb 25 feet north of corner	755.86
Columbus; chisel mark on curb at northwest corner of court-house	772.20
Columbus; aluminum tablet set in northwest corner of court-house below corner stone, marked "778 COLUMBUS 1899"	777.595
Columbus; city datum on water table at northeast corner of State capitol, city datum elevation 780.630	780.374
South Columbus, 2 miles east of; top of iron-pipe culvert at crossing, south end	756.5
South Columbus, 2.4 miles east of; top of stone monument, center of crossroad to east	762.48
South Columbus, 2.5 miles southeast of; iron post set as triangulation point at Baker Hill, marked "819 COLUMBUS 1899"	818.634

COLUMBUS, VIA REYNOLDSBURG, WINCHESTER, AND BRICE, TO DUVALL.

	Feet.
Columbus; chisel mark on curb 100 feet west of southwest corner of Mound and Third streets	772.20
Columbus; chisel mark on curb at northeast corner of Seventh and Mound streets near water trough	765.44
Columbus, 3 miles east of; aluminum tablet set in top of south wing west abutment of Main street bridge over Alum Creek, marked "760 COLUMBUS 1899"	760.066
Columbus, 4 miles east of; chisel mark on north end of culvert near Spring Grove House	783.87
Columbus, 5 miles east of; cross on threshold of schoolhouse No. 7	778.75
Columbus, 6 miles east of; chisel mark on south end of culvert at cross roads	785.05
Columbus, 6.8 miles east of; chisel mark on south end of culvert 700 feet east of tollgate	786.24
Columbus, 7.6 miles east of; chisel mark on top of south wing west abutment of bridge over Big Walnut Creek	771.97
Columbus, 8½ miles east of; chisel mark on south end of culvert 200 feet east of crossroads	820.50
Reynoldsburg, 1½ miles west of; chisel mark on east end of culvert at road leading to Brice	864.28
Reynoldsburg; aluminum tablet set in second step of south wing west abutment of bridge over Black Lick Creek, marked "863 COLUMBUS 1899"	862.779
Brice, 2½ miles north of; chisel mark on top of west end of culvert 700 feet south of National Pike	850.40
Brice, 1,000 feet north of; chisel mark on abutment at southeast corner of small bridge	780.99
Brice, 1 mile south of; chisel mark on east wing south abutment of Black Lick Creek bridge	774.72
Brice, 2 miles south of; chisel mark on bowlder at crossroads	769.57
Winchester, 1 mile northwest of; chisel mark on curb at east side of road, 100 feet south of fork in road	763.31
Winchester; chisel mark on south abutment west wing of canal bridge	767.50
Winchester, ½ mile south of; aluminum tablet set in east end of bridge seat, north abutment, highway bridge over Little Walnut, marked "758 COLUMBUS 1899"	757.975
Winchester, 1½ miles south of; chisel mark on stone monument at crossroad	853.57
Lithopolis, 1,000 feet north of; chisel mark on north wing, east abutment	920.30
Lithopolis; chisel mark on south end of step block at west door of Elkhorn Hotel	902.09
Lithopolis, 1.2 miles south of; chisel mark on bowlder near top of hill	878.88
Lithopolis, 1.5 miles south of; cross on bridge plate, northwest corner	801.61
Lithopolis, 1.5 miles south of; on county line road; aluminum tablet set in west wing, south abutment, of small highway bridge; marked "COLUMBUS 886, 1899"	888.710
Marcy, 1 mile north of; top of stone monument at intersection of county line road and road leading east	968.21
Marcy, county-line road, 2.2 miles west of; chisel mark on threshold of west door of schoolhouse	845.99
Marcy, county-line road, 3 miles west of; top of rivet of top chord, southwest corner of bridge	774.22

	Feet.
Duvall, 4 miles east of; cross mark on lower step of stone steps at church.	754.17
Duvall, 3 miles east of; top of bolthead at southwest corner of bridge, marked with paint	712.60
Duvall, 2¼ miles east of; chisel mark on parapet wall, northwest corner of bridge over Little Walnut Creek	712.98
Duvall, 2.5 miles east of; aluminum tablet set in west end of north abutment of bridge over Little Walnut Creek, marked "711 COLUMBUS 1899"	711.630
Duvall, 1 mile east of; top of pipe culvert under crossroad	731.5
Duvall, chisel mark on top step to schoolhouse No. 8, at east door	719.26
Duvall, spike in first telegraph pole north of road	713.02

COLUMBUS, OVER NATIONAL PIKE, VIA DARBY CREEK AND GEORGESVILLE TO GROVE.

Columbus, corner of Central avenue and Broad street; chisel mark on curb, southeast corner	711.84
Columbus, Broad street, south side of; chisel mark on curb, 1,500 feet west of insane asylum, near large elm	783.84
Columbus, Broad street and end of street-car line; chisel mark on curb at northeast corner	793.86
Columbus, 3 miles northwest of; aluminum tablet set in top of west parapet wall of arch culvert on Sullivant pike, 400 feet north of Baltimore and Ohio Railroad, marked "788 COLUMBUS 1899"	788.364
Columbus, 6 miles west of; chisel mark on east end of culvert under crossroads at church	840.54
Columbus, 7 miles west of; chisel mark on west end of culvert on north side of National pike, under north and south road	873.16
Columbus, 8½ miles west of; top of ring in stone milepost at Rome	921.31
Columbus, 9 miles west of; chisel mark on east end of culvert under road leading north at Rome	924.23
Columbus, 9½ miles west of; chisel mark on north end of arch culvert near road leading south	920.81
Alton, ½ mile east of chisel mark on west wing north end of arch culvert.	909.83
Alton, ½ mile west of; chisel mark on north parapet wall of arch culvert.	907.50
Alton, 1¼ miles west of; top of post at northwest corner of road leading north	925.10
Alton, 3 miles west of; chisel mark on north end of culvert near road leading north	926.27
West Jefferson, 1¾ miles east of; aluminum tablet set in first step of north wing, east abutment of bridge over Big Darby Creek, marked "869 COLUMBUS 1899"	868.845
Georgesville, 1½ miles east of; chisel mark on west end of culvert 500 feet north of east and west road to Georgesville	921.11
Grove, 5½ miles west of; top of east end of drain tile between forks in road	916.5
Grove, 4½ miles west of; chisel mark on bridge seat southeast corner of 10-foot bridge	887.704
Grove, 3 miles west of; top of bowlder at private road	892.77
Grove, 2 miles west of; nail in top of stump at fork in road	898.48
Grove, ¾ mile west of; chisel mark on wing wall southwest corner of 15-foot bridge	873.17

GROVE TO COLUMBUS PIKE, NEAR SPANGLER.

	Feet.
Grove, chisel mark on north end of threshold of door to post-office	851.25
Grove, 2.2 miles east of; top of bowlder at side of road 900 feet east of north and south road, marked with paint	814.51
Grove, 4.4 miles east of; top of post at southwest corner of Jackson pike and east and west road at church	719.96
Grove, 4.5 miles east of; chisel mark on southwest end of parapet wall southwest corner of bridge over Scioto River	706.14
Grove, 5.3 miles south of; chisel mark on second step west abutment north wing of canal bridge	700.65

GROVE TO COLUMBUS.

Grove, 1,000 feet north of; chisel mark on east end of small bridge abutment	840.77
Urbancrest, south base, west Columbus sheet; marked "836 COLUMBUS 1899"	836.18
Urbancrest; chisel mark on top of parapet wall west end of culvert under Grove pike	832.92
Columbus, 4.9 miles southwest of; top of bolthead on north end of west girder, marked with paint	749.4
Columbus, 4.2 miles southwest of; chisel mark on threshold of north door schoolhouse No. 5	769.04
Columbus, 3.7 miles southwest of north base of West Columbus quadrangle; marked "762 COLUMBUS 1899"	762.37
Columbus, 3 miles southwest of; chisel mark on top of bowlder at road corner leading west	770.31
Columbus, corner Mound street and Central avenue; chisel mark on west end of culvert	723.09
Columbus, Mound street; chisel mark on parapet wall near foot of north end post at east end of bridge	722.17

GEORGESVILLE, VIA COUNTY CORNER, DERBY, AND MATVILLE, TO GROVE.

Georgesville, 4 miles southeast of; chisel mark on west end of small bridge	885.48
Georgesville, 4½ miles southeast of; top of bowlder at east and west road corner	882.40
Harrisburg, 3 miles north of; aluminum tablet set in west end of bridge seat, north abutment, bridge over Big Darby Creek, marked "813 COLUMBUS 1899"	812.779
Southwest county corner, 3.9 miles north of; chisel mark on east end of culvert floor of sluice	912.47
Southwest county corner, 2.6 miles north of; chisel mark on south end of small bridge	920.831
Southwest county corner, 1 mile north of; chisel mark on bowlder at northeast corner of road leading north	949.10
Harrisburg, 5 miles west of; southwest corner of Franklin County, aluminum tablet set in stone corner post, marked "933 COLUMBUS, 1899"	933.045
Derby, ½ mile west of; top of stone monument center of north and south road and Derby road	916.11
Derby, ½ mile east of; aluminum tablet set in bridge seat, west corner of small iron bridge, marked "903 COLUMBUS 1899"	903.21
Derby, 2 miles east of; nail in top of oak stump 50 feet north of road, four corners	887.07

	Feet.
Commercial Point, 3 miles west of; top of stone monument center of east and west road and crossroad to south	846.20
Commercial Point; aluminum tablet set in water table, at southwest corner of school building, marked "792 COLUMBUS 1899"	791.87
Matville, 1½ miles north of; top of stone monument at center of north and south and east and west road	848.41
Grove, 5½ miles south of; top of west end of north wall, small bridge marked with paint	864.2
Grove, 2 miles south of; top of wall west end of south abutment marked with paint	879.5
Grove, 1 mile south of; top of west end of parapet wall of small bridge marked with paint	865.4

ALABAMA—GEORGIA.

RANDOLPH AND CHAMBERS COUNTIES, ALABAMA, HEARD AND TROUP COUNTIES, GEORGIA.

Wedowee Quadrangle.

The elevations in the following list are based on a bronze tablet set in the Union Station at Anniston, Alabama, and marked "A 710." The height of this is accepted as 709.902 feet above mean sea level. (See page 387, Appendix to Twentieth Annual Report.)

The leveling was done under the general direction of Mr. W. L. Miller and Mr. Glenn S. Smith, topographers, by W. S. D. Moore, level man.

All bench marks dependent on this datum are marked with the letters "ANNISTON" in addition to their figures of elevation.

BEASONS MILL VIA WEDOWEE, ROANOKE, AND DOUBLE HEAD, TO FINLEY.

	Feet.
Beasons Mill, fork of Chulafinnee and Pinetuckey Gold Mine roads; iron post, marked "888 A"	887.717
Beasons Mill, 6.4 miles south of; on McIntosh road, in northeast corner of crossroads; nail in root of red oak	1,237.97
Beasons Mill, 7.3 miles south of; crossroads near top of hill, in southeast angle; nail in root of black oak, marked "1347"	1,347.04
Beasons Mill, 11.8 miles south of, and ¼ mile north of Union Church; in fork of Heflin and Arbicoochee roads; iron post, marked "1101 Anniston"	1,101.437
Beasons Mill, 13.4 miles south of, and 200 feet south of Linville ford and iron bridge roads; nail in root of pine, marked "1069"	1,069.24
Beasons Mill, 15.5 miles south of, and 1 mile north of iron bridge; nail in root of black oak 30 feet south of fork of roads, marked "924"	924.00
Wedowee, 4½ miles north of; iron bridge over Little Tallapoosa River, in top of east end of south pier; copper bolt, marked "789 A"	788.987
Wedowee, 1 mile north of; 100 feet north of Wedowee Creek; nail in root of red oak, marked "781"	780.84
Wedowee, Randolph County court-house, in west face at southwest corner; aluminum tablet, marked "854 ANNISTON"	854.013
Wedowee, 1½ miles south of; at fork of roads; nail in root of red oak, marked "994"	994.05

	Feet.
Wedowee, 4 miles south of; Roanoke roads, fork of Upper and Middle, 100 feet north of; nail in root of walnut, marked "1070"	1,069.65
Wedowee, 5.1 miles south of; Roanoke roads, fork of Middle and Lower, 50 feet north of; nail in root of black oak, marked "1064"	1,064.06
Cornhouse Creek, 50 feet south of ford of; 30 feet east of road; copper bolt set in rock, marked "830 ANNISTON"	830.063
Kidd Hill, 100 feet north of fork of roads, on west side of east fork; nail in root of dead oak, marked "1204"	1,203.93
Roanoke, 3½ miles northwest of; nail in root of red oak, marked "1066"	1,066.16
Roanoke, at corner of Wedowee and Highshoals streets; nail in root of red oak	818.07
Roanoke, at corner of Main and Wedowee streets, in west wall near northwest corner of Shuesler's store; bronze tablet, marked "846 ANNISTON"	846.146
Roanoke, 50 feet south of Guy street, opposite pump house; paint mark on stone	834.27
Roanoke, 1.8 miles south of, and 100 feet south of branch flowing southeast; nail in root of poplar, marked "808"	807.84
Roanoke, 2.7 miles south of; junction with Wedowee road, 30 feet west of; nail in root of red oak, marked "855"	855.12
Roanoke, 4.1 miles south of; Pisgah Church, on west side of road, in front of; nail in root of post oak	829.23
Double Head, in fork of roads, 500 feet south of post-office, iron post, marked "811 ANNISTON"	811.142
Double Head, 2.6 miles south of; creek 50 feet north of bridge and 30 feet west of road; copper bolt set in stone, marked "684 ANNISTON"	684.220
Double Head, 4.8 miles southeast of; at Higgins's gin, at crossing of Roanoke and Lafayette road, in southeast angle; nail in root of red oak, marked "790"	790.41
Stroud, 18 feet south of southwest corner of railroad station platform; iron post, marked "851 ANNISTON"	851.721
Stroud, ½ mile east of; 20 feet west of fork of roads; nail in root of post oak, marked "837"	837.28
Finley, in fork of roads, 400 feet south of post-office; iron post, marked "775 ANNISTON"	775.459

FINLEY, VIA ROCK MILLS, WEHADKEE, AND OMAHA, TO GRAHAM.

Hickory Flats, in northeast angle of crossroads; nail in root of fallen locust.	763.65
Hickory Flats, 2.5 miles north of; at Bacon Level; on east side of road opposite Fellowship Church; nail in root of black oak, marked "141"	740.90
Rock Mills, 10 feet south of; east end of bridge over Wehadkee Creek; copper bolt set in stone, marked "744 ANNISTON"	745.004
Rock Mills, 3.2 miles north of; at Lee's gin, 50 feet east of fork of roads; nail in root of pine	796.35
Pittman, 1 mile south of; in northeast angle of fork of roads; iron post marked "927 ANNISTON"	927.771
Wehadkee, in southeast angle of crossroads; nail in root of hickory	968.35
Wehadkee, in southwest angle of crossroads; iron post, marked "972 ANNISTON"	972.144
Wehadkee, 2.3 miles north of; Rock Mills and Roanoke roads, in northeast angle of fork of; nail in root of pine	1,227.05
Wehadkee, 4.9 miles north of; fork of roads, 10 feet west of; nail in root of post oak, marked "1318"	1,318.58

	Feet.
Omaha, at crossroads, ½ mile south of post-office; iron post, marked "1310 ANNISTON"	1,310.515
Waldrep, in southeast angle of crossroads, ½ mile south of post-office; nail in root of hickory, marked "1373"	1,373.82
Redoak Church, on south side of road, 100 feet west of fork of roads; nail in root of black oak	1,197.96
Redoak Church, on south side of road opposite church; iron post, marked "1201 ANNISTON"	1,201.569
Sewell, on west side of road, opposite fork of roads; nail in root of black oak, marked "1249"	1,249.54
Sewell, on west side of road, at southeast corner of store; iron post, marked "1254 ANNISTON"	1,254.490
Sewell, fork of Graham and Beech Ford roads, 10 feet east of; nail in root of black oak, marked "1171"	1,271.25
Graham (locally known as Brockville), on west side of street, 250 feet north of post-office; nail in root of dead oak, marked "1105"	1,104.90
Graham, 2 feet south of southeast corner of Masonic building; iron post, marked "1098 ANNISTON"	1,098.812

GRAHAM, VIA LOFTY AND STONE HILL, TO BEASONS MILL.

Graham, 1¼ miles north of; on McIntosh road, 50 feet north of fork of Settlement road and 1,000 feet east of crossing of Graham-Arbicoochee road; nail in root of black oak, marked "1078"	1,078.88
Graham, 3.2 miles west of and ½ mile northeast of Lovens Mills, in fork of roads; nail in root of black oak, marked "964"	963.91
Stone Hill, 2 miles east of, at fork of McIntosh and Lofty roads; nail in root of long-leaf pine, marked "1158"	1,158.85
Stone Hill, in southeast angle of crossroads, ¼ mile north of mine; nail in root of apple tree, marked "1126"	1,126.36

FINLEY, VIA M'GHEE'S BRIDGE, TO ANTIOCH AND LAGRANGE.

Standing Rock; on north side of road, 200 feet east of crossroads; nail in root of red oak, marked "788"	788.69
Evansville; at crossing of State line road, ½ mile south of post-office, in southeast angle; nail in root of hickory, marked "683"	683.65
Evansville, 2.3 miles east of; fork of West Point and Lagrange roads, 200 feet east of; on south side of road; nail in root of pine, marked "720".	720.39
Vernon; on north side of road, opposite fork of roads; nail in root of red oak, marked "660"	660.79
McGhee's bridge; on north side of road, 150 feet west of approach to bridge over Chattahoochee River; nail in root of honey locust, marked "603"	603.24
McGhee's bridge; in south pier of bridge over Chattahoochee River, in west face at southwest corner; bronze tablet, marked "591 ANNISTON".	591.554
McGhee's bridge, 0.8 miles north of; top of hill on west side of road; nail in root of black oak, marked "764"	763.91
McGhee's bridge, 2.3 miles north of; in fork of Houston and Antioch roads; nail in root of post oak, marked "685"	685.65
Antioch, 1½ miles south of; at forks of roads; nail in root of persimmon, marked "756"	756.38
Antioch, in southeast of angle of crossroads; iron post, marked "744 ANNISTON"	744.584

	Feet.
Lagrange, 4 miles west of, at crossroads; nail in root of post oak, marked "761"	746.25
Lagrange; in north face of Troup County court-house, at northeast corner; aluminum tablet, marked "785 ANNISTON"	785.761

LAGRANGE TO FRANKLIN.

Lagrange, 2 miles north of, at junction with road from; nail in root of post oak, marked "660"	659.94
Lagrange, 6.4 miles north of; Wears Crossroads, in northwest angle of; iron post, marked "751 ANNISTON"	751.482
Lagrange, 9 miles north of, at junction with road from; nail in root of post oak, marked "745"	745.07
Asbury (locally known as Harrisonville), crossroads in northwest angle; nail in root of post oak, marked "691"	690.90
Asbury, 1 mile north of	681.316
Asbury, 1.2 miles north of; 50 feet northeast of east end of bridge over New River; iron post, marked "625 ANNISTON"	625.657
Franklin, 4 miles south of, at forks of river and bridge roads; nail in root of black gum, marked "724"	724.50
Franklin, 1¾ miles southeast of, in fork of roads; nail in root of white oak, marked "796"	796.68
Franklin, in east face of northeast corner of Heard County court-house; aluminum tablet, marked "695 ANNISTON"	695.616

FRANKLIN TO ROOPVILLE AND STAR POINT.

Franklin, 3.2 miles southwest of, at Hillabyhatchie Creek, 2 feet west of south end of bridge; iron post, marked "637 ANNISTON"	637.726
Franklin, 1 mile north of, at crossroads, in northeast angle; nail in root of mulberry, marked "771"	771.60
Franklin, 3 miles north of, at Humphrey's mill, 2 feet east of north end of bridge over Centralhatchie Creek; iron post, marked "648 ANNISTON"	648.388
Centralhatchie, 2 miles southeast of, at junction of road from Centralhatchie with Five Notch road; iron post, marked "672 ANNISTON"	672.008
Centralhatchie, in forks of road opposite cotton gin; iron post, marked "848 ANNISTON"	848.815
Roopville, on east side of street 200 feet south of road leading west; iron post, marked "1253 ANNISTON"	1,253.545
Star Point schoolhouse, 300 feet south of; in angle formed by crossroads; iron post, marked "1074 ANNISTON"	1,074.148

ROOPVILLE TO GRAHAM.

Tyus, ¼ mile west of; on south side of road, opposite church; nail in root of red oak, marked "1171"	1,172.43
Tyus, 1.7 miles west of; at Zion Church, in southwest angle of crossroads, 150 feet east of church; nail in root of black oak	1,064.29
Graham, 4.1 miles east of; branch flowing northwest, 20 feet east of; nail in root of hackberry	1,026.84
Graham, 2½ miles east of; at junction of McIntosh with Bowden and Wedowee road; iron post, marked "961 ANNISTON"	961.508

CENTRAL SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. John H. Renshawe, geographer in charge, spirit leveling was continued for the control of the regular topographic work executed during the year in the various localities listed below.

OHIO—MICHIGAN.

MONROE COUNTY, MICHIGAN, LUCAS, WOOD, AND OTTAWA COUNTIES, OHIO.

TOLEDO, MAUMEE BAY, AND OAK HARBOR QUADRANGLES.

The elevations in the following list are dependent on a bench mark established by the United States Coast and Geodetic Survey in 1899 at Toledo, Ohio, from a line starting at Gibraltar, Michigan, and running south to Cincinnati, Ohio. The bench mark is a copper bolt placed in the southwest side of the Government building at Toledo, Ohio, and lettered U.S.C. & G.S., the elevation of which is 603.083 feet above mean sea level.

The leveling was done by Mr. Dean Halford, levelman, under the direction of Mr. Charles E. Cooke, topographer.

MICHIGAN.

	Feet.
Trilby, 1 mile northeast of; in corner of secs. 4, 5, 32, and 33, on line between Ts. 8 and 10 S., R. 7 E., on the Jackman road and ½ mile east of I. J. Jackman's house, in top tier of the south abutment of bridge over Halfway Creek; copper plate, marked "TOLEDO 607"	606.944
Secs. 1, 2, 35, and 36, on line between Ts. 8 and 9 S., R. 7 E., corner of, at northeast corner of crossroads, ½ mile west of Ann Arbor Railroad; + cut in stone	595.79

OHIO.

Toledo, 3½ miles west of; on south side of east abutment of bridge over Tenmile Creek, on Monroe street	519.34
Secs. 24 and 25, T. 9 S., R. 6 E., between, on southwest corner of west abutment of bridge over Tenmile Creek where it crosses Central avenue	604.43
Sylvania, ¼ mile east of, on Monroe street, on east center of top tier of north abutment of culvert over north fork of Tenmile Creek; copper plate, marked "TOLEDO 639"	639.211
Sec. 1, T. 9 S., R. 7 E., 5 miles north of Toledo, 1,200 feet north of Drouillard's Hotel, in face of culvert on west side of Toledo and Detroit pike; copper plate, marked "TOLEDO 586"	585.787
Sec. 6, T. 9 S., R. 8 E., southwest quarter of, 300 feet east of brick house on south side of road; crosscut on north corner of the northeast pier at east end of bridge	582.66
Sec. 7, T. 9 S., R. 8 E., NE. ¼ of, about 600 feet west of Mr. Hartop's house; crosscut on south corner of south pier at east end of bridge	582.66
Sec. 8, T. 9 S., R. 8 E.; crosscut in upper tier of the southwest pier at east end of bridge over Tenmile Creek	578.86
Toledo; at southeast corner of New York avenue and Erie street; top of fire plug	595.33

	Feet.
Secs. 2, 22, 27, and 28, T. 9 S., R. 6 E., ⅛ mile west of corner of; 400 feet east of small house on south side of road; crosscut on northeast corner of culvert on north side of road	652.79
Holland; crosscut in north side of brick foundation of annex to post-office.	636.50
Sec. 8, T. 3, of the Twelvemile Reservation, in southwest ¼ of; 2 miles west of Air Line Junction, on stone pike between Toledo and Holland, in top tier of center slot of culvert at south side of road; copper plate, marked "TOLEDO 624"	624.359
Sec. 9, T. 3, of Twelvemile Reservation, southeast ¼ of; crosscut on top tier of northwest pier head of bridge over Swan Creek	590.63
Maumee; about 2 feet southeast of Wayne street, at corner of Conant; crosscut on west face of Eckers' drug store	634.11
Waterville; crosscut on guard rail 2 feet west of first pier on north side of bridge over Maumee River	620.72
Sec. 17, T. 1, of Twelvemile Reservation, center of; on road leading north from Waterville to Monclova and ¾ mile south of the Wabash Railroad, on top pier at west end of north abutment of bridge over branch; copper plate, marked "TOLEDO 639"	639.399
Monclova, 600 feet west of; crosscut on northeast corner at the north end of the middle pier of bridge over Swan Creek	628.33
Holland, ¼ mile south of, on road to Monclova; on top tier at west end of north pier abutment of bridge over Wolf Creek; copper plate, marked "TOLEDO 617"	616.757
Sec. 27, T. 3, of Twelvemile Reservation, in center of; 300 feet east of crossroads, crosscut on top tier at north end of west pier head of bridge over Grassy Creek	608
Lime City; opposite schoolhouse, in northwest corner of foundation of church; copper plate, marked "TOLEDO 647"	647.239
Perrysburg, 1 mile south of; in top tier at east end of south pier abutment of bridge over Grassy Creek; copper plate, marked "TOLEDO 636"	635.815
Hobart station; crosscut on top of south end of iron culvert running under Toledo and Ohio Central Railway	619
Walbridge, 1 mile west of; in north end of west pier abutment of bridge over Cedar Creek; copper plate, marked "TOLEDO 619"	618.691
Walbridge, ½ mile north of; in face of north pier abutment of bridge over Cedar Creek; copper plate, marked "TOLEDO 614"	614.353
Sec. 26, T. 9 S., R. 8 E., in center of; 2½ miles east of Ironville; copper plate, marked "TOLEDO 587"	586.907
Secs. 28 and 29, T. 9 S., R. 9 E., on line between; ¾ mile south of Jamestown, at crossroads; cross cut on top tier at north end of east pier head of bridge over ditch	579.44
Curtice; at corner of secs. 28, 29, 32, and 33, T. 8 N., R. 13 E.; cross cut on top tier at middle slot of culvert at southwest corner of crossroads	596.32
Curtice, 1 mile south of; in west end of south pier of abutment of bridge over Crane Creek; copper plate, marked "TOLEDO 596"	596.216
Secs. 20 and 21, T. 7 N., R. 13 E., on line between; ¾ mile south of Lake Shore and Michigan Southern Railway; crosscut on top tier at west end of north abutment of bridge	608.63
Secs. 4, 5, 32, and 33, on line between Ts. 6 and 7 N., R. 13 E., ¼ mile north of corner of; crosscut on top tier at east end of north abutment of bridge over Packer Creek	625.52
Genoa, 1 mile west of; at northwest corner of crossroads, on stone road, at northeast corner of culvert; copper plate, marked "TOLEDO 626"	625.752

	Feet.
Genoa, 5¾ miles west of; on stone pike in south foundation of D. F. Mann's residence; copper plate, marked "TOLEDO 634"	633. 523
Walbridge, 2 miles south of; on west side of road at crossroads; cross cut on south end of culvert	624. 16
Secs. 1, 6, 7, and 12, T. 7 N., on line between Rs. 13 and 14 E., at corner of; at northwest corner of crossroads and 300 feet east of crossing of Wheeling and Lake Erie Railroad; cross cut on top tier at middle slot of culvert	589. 58
Graytown, 3 miles north of and ¼ mile south of corner of secs. 4, 5, 8, and 9, T. 7 N., R. 14 E.; in the east end of south pier abutment of bridge over Turtle Creek; copper plate, marked "TOLEDO 582"	582. 404
Graytown, ½ mile north of; cross cut on east end of north pier abutment	589. 19
Graytown, 1 mile south of; corner of secs. 28, 29, 32, and 33, T. 7 N., R. 14 E., at northeast corner of crossroads; cross cut on top tier of culvert	603. 69
Genoa, 3 miles east of; in west end of north pier abutment of bridge over Toussaint Creek; copper plate, marked "TOLEDO 599"	599. 292
Genoa; at corner of secs. 3, 4, 33, and 34, on line between Ts. 6 and 7 N., R. 13 E.; crosscut on top of large rock at crossroads	630. 13
Secs. 3, 4, 9, and 10, T. 7 N., R. 14 E.; corner of; ¼ mile south of crossroads; cross cut on second tier at south end of north abutment of bridge	579. 29
Secs. 1, 2, 11, and 12, T. 7 N., R. 14 E., ½ mile south of corner of; cross cut on top tier at west end of south pier abutment of bridge over Packer Creek	579. 34
Sec. 13, T. 7 N., R. 14 E., in middle southern part of; cross cut on top tier at west end of south pier abutment over Touissaint Creek	580. 18
Secs. 13 and 18, T. 7 N., on line between Rs. 14 and 15 E., on line between; 600 feet south of creek road and ¼ mile east of Daniel Muggy's house, in west end of north pier abutment of bridge over Toussaint Creek; copper plate, marked "TOLEDO 578"	578. 320
Oak Harbor, 3 miles north of, on line between secs. 20 and 21, T. 7 N., R. 15 E., at southwest corner of crossroads; cross cut on south end of the east culvert abutment	578. 50
Oak Harbor, 2 miles north and 3 miles east of, on line between secs. 25 and 26, T. 7 N., R. 15 E., at northwest corner of crossroads; nail in root of tree	582. 89
Secs. 31 and 36, T. 7 N., on line between Rs. 15 and 16 E.; ½ mile north of Lake Shore and Michigan Southern Railway crossing; cross cut on east end of north pier abutment of bridge over Lacarpe Creek	578. 99
Lacarne, 1½ miles west of; at corner of secs. 1, 6, 31, and 36, at corner of Ts. 6 and 7 N., and Rs. 15 and 16 E., on south side of road to Oak Harbor, in top tier of culvert; copper plate, marked "TOLEDO 579".	579. 405
Oak Harbor, 1 mile east of, on line between secs. 3 and 4, T. 6 N., R. 15 E.; crosscut on top tier of culvert on south side of road	578. 98
Oak Harbor; on east end of second tier of second abutment from north end of bridge over Portage River; copper plate, marked "TOLEDO 581"	581. 139
Rocky Ridge, ¾ mile south and ½ mile east of, on line between secs. 35 and 36, T. 7. N., R. 14 E.; ¼ mile north of road between Genoa and Oak Harbor; in west end of south pier abutment of bridge over branch; copper plate, marked "TOLEDO 596"	595. 902
Secs. 2, 3, 34, and 35, between Ts. 6 and 7 N., R. 14 E., at corner of; 4 miles west of Oak Harbor, at southwest corner of crossroads; cross cut on top tier of culvert	600. 22

WISCONSIN.

SAUK, JUNEAU, ADAMS, AND COLUMBIA COUNTIES.

THE DELLS QUADRANGLE.

The elevations in the following list are based upon a bronze tablet set in the northeast corner of the court-house at Baraboo, marked "B 890," the elevation of which is 889.681 feet. The elevation of this bench mark was determined from the top of rail in front of the passenger station of the Chicago and Northwestern Railway in Baraboo, which was given as 860.5 feet above mean sea level.

The leveling was done by Mr. D. C. Wray, levelman, under the direction of Mr. W. H. Griffin, topographer.

	Feet.
Reedsburg, 2 miles east of; also sec. 12, T. 12 N., R. 4 E., northeast corner of NW. ¼, southwest of road crossing; iron post, marked "B 938"	937.599
Sec. 23, T. 13 N., R. 4 E., in NE. ¼ of NW. ¼ of, west side of road and 150 feet north of east and west road opposite Winfield Creamery, 400 feet east of Ed Kelley's house; iron post, marked "B 948"	947.809
Sec. 23, T. 14 N., R. 4 E., in E. ½ of NE. ¼ of, in northeast corner of schoolhouse yard; iron post, marked "B 1039"	1,038.887
Sec. 34, T. 15 N., R. 4 E., ¼ mile north of center of, in southeast corner of schoolhouse yard; iron post, marked "B 897"	896.701
Sec. 36, T. 15 N., R. 5 E., in southwest corner of, in northwest corner of schoolhouse yard; iron post, marked "B 857"	857.183
Secs. 34 and 35, T. 14 N., R. 6 E., ¼ corner between, 400 feet southeast of church and 600 feet northwest of red tavern; iron post, marked "B 943"	942.686
Sec. 27, T. 13 N., R. 5 E., 660 feet west of center of, in southwest corner of schoolhouse yard and in southwest corner of cemetery; iron post, marked "B 887"	887.200
Sec. 10, T. 12 N., R. 5 E., ¼ mile west of center of, northeast of crossroads; iron post, marked "B 946"	946.371
Kilbourn City, in west side of northwest corner of schoolhouse foundation; iron post, marked "B 903"	902.745
Sec. 28, T. 14 N., R. 6 E., in SE. ¼ of; in northeast corner of schoolhouse yard and west side of river road; iron post, marked "B 924"	923.807
Sec. 32, T. 15 N., R. 6 E., northwest corner of, in northwest corner of schoolhouse yard; iron post, marked "B 904"	904.385

MARATHON COUNTY.

WAUSAU SPECIAL QUADRANGLE.

The elevations in the following list are based on a bronze tablet set in meridian mark post in court-house park, near corner Third and Scott streets, Wausau, marked "U. S. GEOLOGICAL SURVEY MERIDIAN MARK." The initial height on which the leveling in this locality rests is the elevation of the top of the east rail of the Chicago, Milwaukee and St. Paul Railway at Wausau passenger station. From this the elevation of the central datum as accepted for this locality is 1,221.147 feet.

The leveling was done by Messrs. H. L. Muldrow and R. Wipfler, levelmen, under the general direction of Mr. Robert Muldrow, topographer.

	Feet.
Wausau, near corner of Third and Scott streets, in top of cut stone post in court-house park; bronze tablet, marked "U. S. Geological Survey Meridian Mark W. 1221"	1, 221. 147
Eschwig's tavern, corner of; at corner secs. 12, 13, 7, and 18, T. 30 N., Rs. 6 and 7 E.; 50 feet south of forks of road; iron post, marked "W 1460"	1, 459. 529
Schofield, at foot of hill on east side of Mosinee-Schofield road; iron post, marked "W 1163"	1, 163. 213
Kelly post-office, 10 feet west of fence and diagonally opposite depot; iron post, marked "W 1220"	1, 220. 045
Sec. 18, lot 17, T. 28 N., R. 9 E., on north side of highway; iron post, marked "W 1236"	1, 236. 266
Mosinee post-office, 1 foot from northeast corner of Dessert Public Library; iron post, marked "W 1159"	1, 159. 366
Secs. 18, 19, 13, and 24, T. 27 N., Rs. 7 and 8 E., corner of; iron post, marked "W 1280"	1, 279. 994
Secs. 33, 34, 3, and 4, Ts. 28 and 29 N., R. 9 E., corner of; iron post, marked "W 1249"	1, 248. 921
Sec. 31, T. 29 N., R. 10 E., southwest ¼ of; 20 feet north of intersection of public roads; iron post, marked "W 1451"	1, 451. 268
Norrie post-office, secs. 23 and 26, T. 28 N., R. 10 E., near ¼ corner of; iron post, marked "W 1293"	1, 293. 122
Ingersol, secs. 2 and 3, T. 27 N., R. 10 E., near ¼ corner of; in front of schoolhouse; iron post, marked "W 1252"	1, 252. 225
Sec. 6, lot 9, T. 27 N., R. 9 E., near ¼ corner of; on east side of highway; iron post, marked "W 1301"	1, 301. 420
Sunset post-office; northeast corner of; in sec. 24, T. 29 N., R. 8 E.; iron post, marked "W 1355"	1, 354. 732
Ts. 29 and 30 N., Rs. 9 and 10 E., corner of; 10 feet north of highway; iron post, marked "W 1465"	1, 465. 018
Sec. 4, T. 30 N., R. 8 E., near ¼ corner sec. 36, T. 31 N., R. 7 E.; iron post, marked "W 1407"	1, 407. 179
Secs. 15 and 22, T. 31 N., R. 7 E., on line between; at intersection of public roads at schoolhouse; iron post, marked "W 1305"	1, 305. 487
Secs. 1, 12, 6, and 7, T. 31 N., Rs. 7 and 8 E., corner of; iron post, marked "W 1307"	1, 307. 072
Merrill, at southeast corner of Center and First streets; iron post, marked "W 1267"	1, 266. 505

COLUMBIA AND MARQUETTE COUNTIES.

PORTAGE AND POYNETTE QUADRANGLES.

The elevations in the following list are based upon a United States Lake Survey bench mark, consisting of an iron post 4 feet below ground and 25 feet from wall of lock of canal connecting Wisconsin and Fox rivers at Portage, Wisconsin, and 84.6 feet above recess of upper gate of new lock, the elevation of which was accepted as 791.243 feet above mean sea level.

The leveling was done by Mr. L. E. Granke, levelman, under the direction of Mr. R. C. McKinney, topographer.

	Feet.
Baraboo, at northeast corner of court-house; iron post, marked "PRTG 890"	896.760
Portage, 28½ feet west and 49½ feet south of south end of wagon bridge over Wisconsin River, 2 feet east of fence on west side of road; iron post, marked "PRTG 803"	803.118
Portage, 182 feet south and 8½ feet west of southeast corner of High School building; copper bolt in U. S. G. S. meridian stone, marked "PRTG 804"	804.100
Arlington, 1 mile west of; sec. 15, T. 10 N., R. 9 E., southeast corner of, about 2½ feet south and 5 feet west of fence corner; iron post, marked "PRTG 1066"	1,065.802
Sec. 17, T. 10 N., R. 10 E., ¼ mile north of southeast corner of, 5 feet north and 3 feet west of northeast corner of Leeds schoolhouse, District No. 7; iron post, marked "PRTG 1092"	1,092.332
Sec. 20, T. 11 N., R. 10 E., ¼ mile east of center of, 2½ feet west and 10 feet north of fence corner at northeast corner of crossroads; iron post, marked "PRTG 966"	966.212
Portage, 25 feet from wall of lock connecting Wisconsin and Fox rivers, and 84.6 feet above recess of upper gate of new lock; copper bolt, marked "PRTG 791"	791.243
Poynette, 2½ feet east and 4½ feet north of northwest corner of Presbyterian church at corner of Main and Tomlinson streets; iron post, marked "PRTG 857"	857.031
Sec. 21, T. 12 N., R. 10 E., center of; 9 feet 10 inches north and 2¾ feet west of fence corner, the most northerly of the two formed by intersection of roads; iron post, marked "PRTG 830"	830.246
Sec. 21, T. 13 N., R. 10 E., northeast corner of; 4 feet east and 1 foot south of fence corner, the most southerly of the two formed by intersection of roads; iron post, marked "PRTG 889"	888.549
Sec. 22, T. 14 N., R. 10 E., ½ mile south of center of; 11 feet 1 inch west and 18 feet 4 inches south of the most easterly fence corner formed by the intersection of roads; iron post, marked "PRTG 922"	922.276
Sec. 14, T. 14 N., R. 9 E., 3 miles west and 1/20 mile south of northeast corner, 2 feet west of fence post at forks of roads and east side of road; iron post, marked "PRTG 804"	804.347
Sec. 15, T. 13 N., R. 9 E., ½ mile north of center of; 15½ feet east and 9½ feet north of southeast fence corner at crossroads; iron post, marked "PRTG 837"	837.399
Sec. 5, T. 9 N., R. 10 E., at southeast corner of; 4 feet 5 inches east and 16 feet north of northwest fence corner at crossroads; iron post, marked "PRTG 961"	961.288
Sec. 11, T. 9 N., R. 9 E., ¼ mile south of northwest corner of; 38 feet east and 2 feet south of most easterly fence corner at intersection of roads; iron post, marked "PRTG 984"	984.328
Sec. 27, T. 15 N., R. 9 E., ¼ mile east of southwest corner, 2¼ feet east and 2 feet 7 inches north of southeast corner of schoolhouse; iron post, marked "PRTG 822"	822.074
Sec. 33, T. 15 N., R. 10 E., at southeast corner of; 17 feet 10 inches north and 2½ feet east of intersection of fences on west side of road; iron post, marked "PRTG 798"	798.427

MINNESOTA.

RAMSEY, ANOKA, AND HENNEPIN COUNTIES.

WHITE BEAR AND ANOKA QUADRANGLES.

The elevations in the following list are dependent on the United States Mississippi River Commission bench mark in west end of door-sill at south entrance to basement of court-house at St. Paul, Minnesota. The bench mark is a copper bolt, marked "U.S.P.B.M. 72," the elevation of which is 778.946 feet above mean sea level.

The leveling was done by Mr. D. C. Wray, levelman, under the direction of Mr. W. H. Griffin, topographer.

	Feet.
Gervais Lake, in secs. 5 and 8, T. 29 N., R. 22 W., water level	858.00
Sec. 6, T. 29 N., R. 22 W., northwest corner of; iron post, marked "St.P. 924"	923.811
Owasso Lake, in sec. 36, T. 30 N., R. 23 W., water level	886.00
Rs. 22 and 23 W., T. 29 N., line between; crossing of Minneapolis, St. Paul and Sault Ste. Marie Railway over St. Paul and Duluth Railroad; height of rail	925.21
Lake Vadnais, in secs. 30, 31, and 32, T. 30 N., R. 22 W., water level	877.00
Rs. 22 and 23 W., T. 30 N., line between; at Minneapolis, St. Paul and Sault Ste. Marie Railway; height of rail	899.8
Sucker Lake, in sec 19, T. 30 N., R. 22 W., water level	881.0
Gilfillan Lake, in sec. 17, T. 30 N., R. 22 W., water level	908.0
Birch Lake, in sec. 15, T. 30 N., R. 22 W., water level	918.0
White Bear, in northwest corner of Catholic church yard; iron post, marked "St.P. 932"	932.495
White Bear Lake; water level	923.00
Goose Lake, in sec. 23, T. 30 N., R. 22 W., water level	921.00
Bald Eagle Lake; water level	910.00
Long Lake, at New Brighton; water level	864.00
Centerville, at southeast corner of cemetery; iron post, marked "St.P. 909"	809.035
Centerville Lake, water level	880.00
Peltier Lake, at Centerville village, water level	880.00
Secs. 28 and 33, T. 32 N., R. 22 W., 2,723 feet northeast of line between, at southwest corner of schoolhouse yard (district 59), east side of road; iron post, marked "St.P. 909"	908.931
Marshan Lake, sec. 17, T. 31 N., R. 22 W., water level	880.00
Rice Lake, in secs. 19, 20, 30, and 29, T. 31 N., R. 22 W., water level	880.59
Secs. 25, 36, 26, and 35, T. 31 N., R. 23 W., crossroads ¼ mile north of corner of; iron post, marked "St.P. 910"	910.130
Golden Lake, in sec. 25, T. 31 N., R. 23 W., water level	889.00
Sec. 20, T. 32 N., R. 23 W., center of; at forks of Central avenue and Anoka roads; iron post, marked "St.P. 905"	904.71
Sec. 14, T. 30 N., R. 24 W., in northeast ¼ of southwest ¼ of; northeast corner of schoolhouse yard; iron post, marked "St.P. 858"	857.814
T. 32 N., R. 24 W., northeast ¼ of, on west line of schoolhouse yard, 50 feet north of east and west road; iron post, marked "St.P. 891"	891.006
Crooked Lake, in sec. 33, T. 32 N., R. 24 W., water level	861.00
Round Lake, in sec. 29, T. 32 N., R. 24 W., water level	868.00

	Feet.
Secs. 9 and 16, T. 31 N., R. 24 W., quarter corner of, at southwest corner of crossroads; iron post marked "St. P. 869"	869.20
Sec. 26, T. 32 N., R. 25 W., northwest corner of, 50 feet east of crossroads; iron post, marked "St. P. 892"	892.333
Grass Lake, in NW. ¼ of sec. 26, T. 32 N., R. 25 W., water level	859.00
Dayton town hall, in southwest corner of yard of; sec. 17, T. 120 N., R. 22 W., southeast ¼ of; iron post, marked "St. P. 912"	912.094
Diamond Lake, in (secs. 17 and 18, T. 120 N., R. 22 W., water level	902.00
French Lake, in secs. 19 and 30, T. 120 N., R. 22 W., water level	902.00
Sec. 27, T. 119 N., R. 22 W., near center of, in southeast corner of schoolhouse yard, northwest of crossroads; iron post, marked "St. P. 942"	942.561
Bass Lake, in sec. 2, T. 118 N., R. 22 W., water level	903.00
Medicine Lake, in sec. 18, T. 118 N., R. 22 W., water level	886.00
Sec. 14, T. 118 N., R. 22 W., on north and south ¼ line of, at northeast corner of German Lutheran churchyard, 300 feet north of Rockford road; iron post, marked "St. P. 943"	943.084
Robinsdale, on south line of village hall; iron post, marked "St. P. 879"	879.316
Twin lakes, water level	852.00
Brooklyn Town Hall, in northwest corner of yard of; in sec. 21, T. 119 N., R. 21 W., ¼ mile east of southwest corner of; iron post, marked "St. P. 879"	878.537
Sec. 30, T. 120 N., R. 21 W., ¼ corner south side of; in northwest corner of schoolhouse yard, on east side of Champlain and Anoka roads; iron post, marked "St. P. 883"	883.139
Sec. 17, T. 30 N., R. 23 W., in southwest ¼ of; 2 miles north of New Brighton, at junction of road to east with north and south road; iron post, marked "St. P. 913"	912.748

IOWA.

CLAYTON, FAYETTE, BUCHANAN, AND DELAWARE COUNTIES.

West Union Quadrangle.

The elevations in the following list are dependent on the United States Mississippi River Commission bench mark in the northeast corner of the custom-house at Dubuque, Iowa. This is a copper bolt marked "U.S.P.B.M." (see Appendix to Eighteenth Annual Report, page 326), the elevation of which is 643.481 feet above mean sea level.

The leveling was done by Mr. Tim Burns, levelman, under the direction of Mr. M. Hackett, topographer.

	Feet.
Sec. 14, T. 92 N., R. 6 W., near quarter corner north side of, bridge over Hewitt Creek; cross mark on rivet at northeast corner of	802.00
Volga, in southeast corner of schoolhouse yard; iron post, marked "DBQ 794"	793.869
Sec. 28, T. 92 N., R. 6 W., northwest quarter of; floor of bridge over Hewitt Creek	877.00
Sec. 21, T. 93 N., R. 6 W., northeast quarter of; southeast corner of schoolhouse yard; iron post, marked "DBQ 1147"	1,147.46
Sec. 33, T. 94 N, R. 6 W., northeast quarter of, northeast corner of schoolhouse yard; iron post, marked "DBQ 876"	876.311

	Feet.
Sec. 21, T. 91 N., R. 6 W., quarter corner north side of; iron post, marked "DBQ 1221"	1,221.07
Sec. 27, T. 94 N., R. 6 W., tack in floor of steel bridge near Christian Meyer's house	784.00
Sec. 19, T. 94 N., R. 6 W., near quarter corner west side of; floor of bridge.	799.00
Strawberry Point, top of rail in front of railroad station	1,216.00
Elgin, floor of steel bridge over Turkey River, just east of mill	807.00
Elgin, top of rail in front of railroad station	834.00
Sec. 16, T. 94 N, R. 7 W., southeast ¼ of, in schoolhouse yard; iron post, marked "DBQ 989"	988.652
West Union, public-school building, corner Main and Walnut streets, coping stone south wall of building; aluminum tablet, marked "DBQ 1186"	1,186.296
West Union, south meridian stone in county fair grounds; aluminum tablet, marked "DBQ 1111"	1,110.889
Sec. 16, T. 94 N., R. 9 W., NE. ¼ of, at road crossing; iron post, marked "DBQ 1194"	1,194.168
Sec. 36, T. 93 N., R. 10 W., southwest corner of; large rock at northwest corner of road crossing	1,145.00
Westgate, in sec. 24, T. 92 N., R. 10 W., ½ mile northeast of; gate, doorsill of schoolhouse	1,114.00
Maynard, top of rail at road crossing south of railroad depot	1,101.00
Sec. 21, T. 92 N., R. 9 W., northeast corner of; iron post, marked "DBQ 1164"	1,163.888
Sec. 10, T. 92 N., R. 9 W., southwest corner of; large rock northeast of road crossing	1,140.00
Sec. 16, T. 93 N., R. 9 W., southeast corner of; iron post, marked "DBQ 1128"	1,127.708
Randalia, top of rail in front of railroad station	1,103.00
Cooley Creek, Chicago, Milwaukee and St. Paul Railway, top of rail on bridge over; at milepost 132	1,089.00
Albany, in sec. 14, T. 93 N., R. 8 W., 1,100 feet north of school building; iron post, marked "DBQ 930"	930.463
Wadena, in front of railroad station; iron post, marked "DBQ 873"	873.201
Sec. 21, T. 92 N., R. 8 W., NE. ¼ of, northeast corner of; schoolhouse yard; iron post, marked "DBQ 1168"	1,167.642
Sec. 28, T. 92 N., R. 7 W., northeast corner of; iron post, marked "DBQ 1080"	1,079.897
Oelwein; coping stone of north wall of post-office; aluminum tablet, marked "DBQ 1044"	1,044.073
Sec. 21, T. 91 N., R. 8 W., NE. ¼ of; at cross roads; iron post, marked "DBQ 1143"	1,143.111
Sec. 21, T. 91 N., R. 7 W., NE. ¼ of; in schoolhouse yard; iron post, marked "DBQ 1114"	1,113.537
Hazelton; at railroad station; iron post, marked "DBQ 995"	995.400
Sec. 21, T. 90 N., R. 8 W., NE. ¼ of; at side of wagon road; iron post, marked "DBQ 1063"	1,062.695
Sec. 13, T. 90 N., R. 8 W., south side of floor of steel bridge over Buffalo Creek	1,074.00
Sec. 21, T. 90 N., R. 7 W., NE. ¼ of; at road crossing; iron post, marked "DBQ 1081"	1,080.877
Lamont; top of rail at railroad station	1,044.00
Dundee; railroad station; iron post, marked "DBQ 997"	996.573

MISSOURI.

FRANKLIN, GASCONADE, CRAWFORD, AND WASHINGTON COUNTIES.

UNION QUADRANGLE.

The elevations in the following list are based on the St. Louis city directrix, the elevation of which is accepted as 412.731 feet above the mean sea level.

The leveling was done by Mr. Jesse L. Holman and Mr. H. V. Rees, levelmen, under the direction of Mr. Paul Holman, topographer.

	Feet.
Union, + mark on northwest corner of stone steps of court-house	565.48
Krakow; in NE. ¼ of sec. 8, T. 43 N., R. 1 W., 100 feet northwest of post-office; copper nail in root of oak tree	762.91
Casco; in NE. ¼ of sec. 17, T. 43 N., R. 2 W., in northwest corner of foundation of post-office building; aluminum tablet, marked "St. L. 781"	781.144
Jeffriesburg; in SE. ¼ of sec. 25, T. 43 N., R. 2 W., 100 feet southeast of post-office, + mark on large rock	766.15
Cedar Fork; in NE. ¼ of sec. 19, T. 43 N., R. 3 W., 300 feet west of post-office; nail in root of oak tree	811.00
Port Hudson; in SW. ¼ of sec. 22, T. 43 N., R. 3 W., 1 mile south of post-office, in foundation of store building at crossroads; aluminum tablet, marked "St. L. 867"	867.251
Beemont; in NE. ¼ of sec. 23, T. 43 N., R. 4 W., 2½ miles southeast of post-office, in sandstone ledge on State road; aluminum tablet, marked "St. L. 795"	794.768
Drake; in SE. ¼ of sec. 10, T. 43 N., R. 5 W., in foundation of post-office building; aluminum tablet, marked "St. L. 868"	868.025
Neier; in NE. ¼ of sec. 14, T. 42 N., R. 2 W., in foundation wall of post-office building; aluminum tablet, marked "St. L. 820"	820.313
Luther; in NE. ¼ of sec. 7, T. 42 N., R. 3 W., 1,000 feet northeast of post-office; bolt in northeast corner of bridge over Bourbeuse River	606.92
Shotwell; near center of sec. 7, T. 42 N., R. 3 W., in foundation of post-office building; aluminum tablet, marked "St. L. 855"	854.621
Bourbeuse; in NE. ¼ of sec. 17, T. 42 N., R. 4 W., ¼ mile west of post-office, in foundation of Wortmann's stone building on Springfield road; aluminum tablet, marked "St. L. 897"	896.610
Sec. 23, T. 42 N., R. 5 W., in SE. ¼ of; in foundation of frame house owned by Mr. Holt on the Springfield road; aluminum tablet, marked "St. L. 921"	920.807
Anaconda, on the St. Louis and San Francisco Railroad; spike in northwest corner of station platform	841.39
Stanton, on the St. Louis and San Francisco Railroad; in foundation of hotel building; aluminum tablet, marked "St. L. 872"	871.876
Japan, 3 miles north of; in NE. ¼ of sec. 19, T. 41 N., R. 3 W., at northeast corner of junction of crossroads, on main road to Champion City; iron post, marked "St. L. 778"	778.157
Tea; in SW. ¼ of sec. 8, T. 41 N., R. 4 W., in foundation of T. H. Mathews' store building; aluminum tablet, marked "St. L. 740"	739.866
Boone; near center of sec. 23, T. 41 N., R. 4 W., in front of post-office; copper nail in root of oak tree	749.01
Bem, near center of sec. 27, T. 41 N., R. 5 W., in yard of post-office building; iron post, marked "St. L. 833"	832.978

	Feet.
Sullivan, on the St. Louis and San Francisco Railroad; in wall of Bennett building; aluminum tablet, marked "St. L. 977"	976.610
Elmont; in NE. ¼ of sec. 3, T. 40 N., R. 3 W., 50 feet north of post-office; nail in root of oak tree at junction of roads	972.52
Japan; in NW. ¼ of sec. 6, T. 40 N., R. 3 W. in front of post-office; copper nail in root of oak tree	922.34
Bourbon, on the St. Louis and San Francisco Railroad; in foundation of brick hotel building; aluminum tablet, marked "St. L. 954"	953.827
Oak Hill; in NW. ¼ of sec. 18, T. 40 N., R. 4 W., in foundation of post-office building, aluminum tablet, marked "St. L. 749"	749.332
Oak Hill, 3¼ miles southeast of; in NW. ¼ of sec. 22, T. 40 N., R. 5 W., at crossroads on Oak Hill and Jake Prairie road; iron post, marked "St. L. 964"	963.975
Vilander; in NE. ¼ of sec. 15, T. 39 N., R. 2 W., 160 yards east of post-office; south side of county road; iron post, marked "St. L. 638"	937.706
Leesburg, on the St. Louis and San Francisco railroad; in foundation of Exchange Hotel building; aluminum tablet, marked "St. L. 1023"	1022.739
Delhi; in NE. ¼ of sec. 3, T. 39 N., R. 4 W., in front of post-office; copper nail in root of oak tree	929.39
Whitsell; in SW. ¼ of sec. 6, T. 39 N., R. 4 W., in front of post-office; copper nail in root of oak tree	964.85
Cuba, on the St. Louis and San Francisco railroad; in foundation of Grand Hotel building; aluminum tablet, marked "St. L. 1033"	1,032.798
Jacobston; ⅛ mile west of post-office, in NW. ¼ of sec. 12, T. 39 N., R. 5 W., in rock bluff 30 feet south of Cuba and Jake Prairie road; aluminum tablet, marked "St. L. 852"	851.766
Sec. 5, T. 38 N., R. 2 W., in NW. ¼ of, at north edge of road, 50 yards west of old foundation of Mudd's store building on road from Anthonies Mill to Scotia; iron post, marked "St. L. 868"	867.788
Scotia; ¼ mile northeast of post-office, in NE. ¼ of sec. 11, T. 38 N., R. 3 W., in limestone bluff at north edge of road to Anthonies Mill; aluminum tablet, marked "St. L. 644"	644.301
Cuba; 1¾ miles south of, in SW. ¼ of sec. 5, T. 38 N., R. 4 W., 25 feet east of St. Louis and San Francisco Railroad, at road crossing; iron post, marked "St. L. 966"	966.345
Fanning station; 15 feet west of platform of, in SE. ¼ of sec. 4, T. 38 N., R. 5 W., on St. Louis and San Francisco Railroad, 10 feet south of track; iron post, marked "St. L. 1059"	1,058.563

ARKANSAS.

BENTON AND WASHINGTON COUNTIES.

Fayetteville and Siloam Springs Quadrangles.

The elevations in the following list are based on the United States Coast and Geodetic Survey bench mark at Fayetteville, Arkansas. The bench mark is a + mark cut on the wall of the Arkansas State University building, on the south side of the main entrance, about 2 feet above the ground, the elevation of which is 1,452.49 feet above mean sea level.

The leveling was done by Mr. Clifford Older, under the direction of Mr. H. B. Blair, topographer.

	Feet.
Sulphur Springs, sec. 23, T. 21 N., R. 33 W.; Mr. Joplin's store, in east wall of, 4 feet above ground; aluminum tablet, marked "FTVL 929"	928.780
Gordon Hollow, SE. ¼ of sec. 25, T. 21 N., R. 32 W., at cross roads; iron post, marked "FTVL 1083"	1,083.098
Pinon Hollow, NE. ¼ of sec. 26, T. 21 N., R. 31 W.; forks of road near mouth of; iron post, marked "FTVL 995"	995.419
Sec. 26, T. 21 N., R. 30 W., northwest corner of; iron post, marked "FTVL 1315"	1,315.285
Sec. 33, T. 21 N., R. 29 W., northwest corner of; iron post, marked "FTVL 1348"	1,348.304
Gravet, sec. 12, T. 20 N., R. 33 W.; stone building east of station, in northwest corner of; aluminum tablet, marked "FTVL 1226"	1,225.925
Sec. 2, T. 20-N., R. 32 W., SW. ¼ of, Banks schoolhouse; iron post, marked "FTVL 1287"	1,286.430
Seba, J. A. Corley's store, in front of; iron post, marked "FTVL 1320"	1,319.579
Bentonville, new office building of court-house, northeast corner of; aluminum tablet, marked "FTVL 1303"	1,303.246
Decatur, sec. 13, T. 19 N., R. 33 W., near northwest corner of; iron post, marked "FTVL 1248"	1,247.827
Sec. 26, T. 19 N., R. 32 W., northwest corner of, Eagle Schoolhouse; iron post, marked "FTVL 1415"	1,414.901
Osage Mills, sec. 34, T. 19 N., R. 31 W., Mr. Rous's store, southwest corner of; iron post, marked "FTVL 1334"	1,334.293
Sec. 22, T. 19 N., R. 30 W., northwest corner of; iron post, marked "FTVL 1301"	1,300.553
Sec. 1, T. 19 N., R. 29 W., east side of; on bank of White River; iron post, marked "FTVL 1064"	1,063.843
Orchard; near center of sec. 3, T. 18 N., R. 33 W., 1 block west of public well; iron post, marked "FTVL 1237"	1,237.030
Springtown; northwest corner of sec. 8, T. 18 N., R. 32 W.; iron post, marked "FTVL 1259"	1,258.482
Sec. 11, T. 17 N., R. 32 W., NE. ¼ of; Robinson schoolhouse; iron post, marked "FTVL 1082"	1,081.892
Elm Springs; near center of, sec. 25, T. 18 N., R. 31 W., iron post, marked "FTVL 1167"	1,167.092
Sec. 27, T. 18 N., R. 29 W., northwest corner of; 250 feet west of church; iron post, marked "FTVL 1399"	1,399.116
Wheeler; near northwest corner of sec. 28, T. 17 N., R. 31 W., iron post, marked "FTVL 1274"	1,273.852
Sec. 35, T. 17 N., R. 29 W., northwest corner of; iron post, marked "FTVL 1242"	1,242.313
Wedington Gap; NE. ¼ of sec. 5, T. 16 N., R. 32 W.; iron post, marked "FTVL 1366"	1,366.207
Farmington, opposite church; sec. 26, T. 16 N., R. 31 W., iron post, marked "FTVL 1202"	1,201.710
Fayetteville, in front wall of bank, northwest corner court-house square; aluminum tablet, marked "FTVL 1425"	1,425.038
Baldwin, sec. 20, T. 16 N., R. 29 W., southwest corner of section-house yard; iron post, marked "FTVL 1233"	1,233.288
Siloam Springs, railroad station, southwest corner of platform; iron post, marked "FTVL 1148.6"	1,152.885
Cincinnati, sec. 29, T. 16 N., R. 33 W., west side of main road, northwest end of town; iron post, marked "FTVL 1039"	1,039.208

PIKE, NEVADA, OUACHITA, AND CLARK COUNTIES.

PRESCOTT QUADRANGLE.

The elevations in the following list depend upon the bench mark established by the United States Geological Survey in the season of 1896 at Hot Springs (see page 337, appendix to Eighteenth Annual Report). This bench mark is a copper plate set in the north post of main entrance to Hot Springs Reservation and is marked "H.S. 607," the elevation of which was accepted as 607.422 feet above mean sea level.

The leveling was done by Messrs. Robert Coe and D. C. Wray, levelmen, under the direction of Mr. Duncan Hannegan, topographer.

	Feet.
Hot Springs, on north post at Central avenue entrance to Government reservation; copper plate, marked "H. S. 607"	607.422
Malvern, near front entrance to Hot Spring County court-house; iron post, marked "H. S. 310"	310.345
Malvern, on United States Geological Survey; standard copper tablets set in stone monuments, for meridian marks, in court-house yard.	
North monument	310.608
South monument	306.373
Arkadelphia, at northwest corner of Clark County court-house, under corner stone, in north face of second stone above ground; copper plate, marked "H. S. 246"	246.199
Gurdon, on the northwest corner of Main and West Front streets, in south face near southeast corner of brick building owned by A. W. Newton and used as a general store; aluminum tablet, marked "H. S. 209"	209.525
Curtis, about ¼ mile south of station, on east right-of-way line of St. Louis, Iron Mountain and Southern Railway and on line between secs. 1 and 36, three-fourths mile west of township line; iron post, marked "H. S. 170"	170.510
Bierne, about 880 feet northwest of railroad crossing north of, at quarter corner to secs. 1 and 12, on Dr. Kerston's property, and 250 feet west of Methodist Church; iron post, marked "H. S. 237"	237.855
Boughton, about 130 feet north of railroad, inside fence at the southwest corner of front yard of E. De Laughter's residence; iron post, marked "H. S. 234"	234.044
Prescott, on United States Geological Survey standard copper tablets set in stone monuments in court-house yard as meridian marks.	
North monument	318.687
South monument	316.098
Emmet, 130 feet west of center of station, 25 feet north of main line of St. Louis, Iron Mountain and Southern Railway, 5 feet west of milepost 449, 260 feet east of county line post between Nevada and Hempstead counties; iron post, marked "H. S. 293"	293.325
Hope, at southwest corner of Main and East Second streets, in north face of large foundation stone at northeast corner of Hempstead County Bank; aluminum tablet, marked "H. S. 356"	356.440
Whelen, 450 feet west of station and 30 feet south of corner to secs. 26, 27, 34, and 35, T. 10 S., R. 20 W.; iron post, marked "H. S. 247"	247.005
Chidester, about 180 feet northeast of station, 50 feet east of track; iron post, marked "H. S. 230"	230.583

	Feet.
Camden, Ouachita County court-house, in west face of second stone above ground and from northwest corner; iron post, marked "H. S. 199"	199.372
Buena Vista, opposite station, about 75 feet south of main track of St. Louis Southwestern Railway, in front of residence of Mrs. Martha E. Sifford; iron post, marked "H. S. 287"	287.540
Prescott, in meridian stone in front of court-house, in court-house yard; bronze tablet, marked "H. S. 318"	318.686
Laneburg, ½ mile north of, in sec. 9, T. 12 S., R. 22 W., southeast corner of; iron post, marked "H. S. 284"	284.054
Bodcaw, 4.8 miles southeast of, in T. 14 S., R. 22 W., on line between secs. 15 and 16 and 600 feet south of corner to, north side of road; iron post, marked "H. S. 371"	371.457
Willisville, 2 miles east of, in sec. 16, T. 14 S., R. 21 W., southeast corner of, at junction of Rosston and College Hill road with Camden and Texarkana road; iron post, marked "H. S. 361"	361.768
Woodlawn, 1 mile southwest of, in T. 14 S., R. 20 W., on line between secs. 14 and 23 and 500 feet west of corner to, north side of road and east side of creek; iron post, marked "H. S. 254"	254.893
Woodlawn, 4 miles east of, in T. 14 S., R. 19 W., ¼ mile north of line between secs. 9 and 10, on property of H. L. Lusby, 30 feet north of Camden and Texarkana road; iron post, marked "H. S. 263"	263.296
Sec. 9, T. 11 S., R. 23 W., near southeast corner of, on line between Nevada and Hempstead counties and 50 feet north of Washington road; iron post, marked "H. S. 327"	327.097
Bennett's, ¼ mile west of, in sec. 16, T. 13 S., R. 22 W., in southeast corner of, 350 feet south of crossroads; iron post, marked "H. S. 372"	372.359
Clayton, 2⅓ miles west of, in sec. 4, T. 13 S., R. 22 W., near quarter corner east side of, on line between Nevada and Hempstead counties, north side of Hope-Camden road and 300 feet west of road north to church; iron post, marked "H. S. 338"	338.229
Sec. 33, T. 14 S., R. 23 W.; southeast corner of, on line between Nevada and Hempstead counties, east side of road opposite road to west, 5¼ miles west of Bodcaw; iron post, marked "H. S. 331"	331.831
Rosston, southwest of cross roads to, in sec. 21, T. 13 S., R. 21 W., at quarter corner south side of; iron post, marked "H. S. 378"	378.307
Caney post-office, ⅛ mile west of, in sec. 21, T. 13 S., R. 20 W., quarter corner east side of, 80 feet north of road; iron post, marked "H. S. 324"	324.336
Sec. 7, T. 13 S., R. 19 W., 5 miles east of Caney, on north side of Camden road and 300 feet east of White Oak Creek; iron post, marked "H. S. 218"	218.192
Morris, ¼ mile north of, in sec. 26, T. 12 S., R. 21 W., in NW. ¼ of, at southwest corner of cemetery at Caney church and schoolhouse, northeast of cross roads; iron post, marked "H. S. 264"	264.395
Bluff City, 1¾ miles southwest of, in sec. 10, T. 12 S., R. 20 W., quarter corner south side of, 75 feet west of road and 60 feet north of Spring Branch; iron post, marked "H. S. 283"	283.701
Secs. 21 and 22, T. 11 S., R. 20 W., on line between and ⅛ mile south of corner of, north side of Prescott and Bluff City road; iron post, marked "H. S. 173"	173.746
Prescott, 6 miles east of, sec. 8, T. 11 S., R. 21 W., near southeast corner of, on south side of road and on west side of road to south; iron post, marked "H. S. 333"	333.372
Prescott, 4½ miles north of, in sec. 17, T. 10 S., R. 22 W., southeast corner of, at southwest corner of cross roads; iron post, marked "H. S. 376"	376.399

	Feet.
Secs. 15 and 16, T. 10 S., R. 23 W., on line between, and on line between Nevada and Hempstead counties, south side of Washington road; iron post, marked "H. S. 346"	345.924
Elkins Ford on Little Missouri River, 1 mile north of, in sec. 21, T. 9 S., R. 22 W., quarter corner east side of, 30 feet west of road; iron post, marked "H. S. 216"	216.810
Sec. 15, T. 9 S., R. 21 W., southeast corner of, 100 feet north of track and 30 feet west of road; iron post marked "H. S. 319"	318.939
Okolona, in southwest corner of high-school yard; in sec. 34, T. 8 S., R. 22 W.; iron post, marked "H. S. 423"	423.070
Antoine, 3 miles south of, in sec. 33, T. 8 S., R. 23 W., at west side of military road; iron post, marked "H. S. 324"	324.610
Smithton, 4 miles east of, in sec. 20, T. 9 S., R. 19 W., 60 feet south of old grade at log road and 60 feet west of end of lane to south, between two buildings on property of W. A. Young; iron post, marked "H. S. 176"	176.576
Barham post-office, 1 mile north of, in sec. 26, T. 11 S., R. 19 W., quarter corner south side of, 150 feet east of road and 300 feet northeast of J. B. Benton's house; iron post, marked "H. S. 267"	267.136
Whelen Springs, 3¾ miles northeast of, on line between secs. 19 and 20, T. 11 S., R. 19 W., on north side of Gurdon-Camden road; iron post, marked "H. S. 198"	198.706

NEBRASKA.

DAWSON, M'PHERSON, LOGAN, LINCOLN, AND FRONTIER COUNTIES.

North Platte and Gothenburg Quadrangles.

The elevations in the following list depend upon the bench mark established in the season of 1896 at Sidney, consisting of a copper bolt set in the astronomic monument in the parade grounds of old Fort Sidney, marked "U.S.G.S. 4086 feet B.M." (See Appendix to Eighteenth Annual Report, p. 338.)

The leveling was done by Mr. E. E. Sands, under the direction of Mr. C. W. Goodlove, topographer.

	Feet.
Ellis schoolhouse, sec. 19, T. 15 N., R. 30 W.; iron post, marked "SIDNEY 2946"	2,945.822
Sec. 16, T. 15 N., R. 31 W., southwest corner of; iron post, marked "SIDNEY 3075"	3,075.231
Sec. 7, T. 15 N., R. 31 W., NE. ¼ of; on old north and south wagon road; iron post, marked "SIDNEY 3087"	3,086.543
Sec. 31, T. 16 N., R. 30 W., south side of; on road north from Ellis ranch; iron post, marked "SIDNEY 3043"	3,043.281
Sec. 21, T. 16 N., R. 30 W., on road north from Ellis; iron post, marked "SIDNEY 3077"	3,077.258
Sec. 10, T. 16 N., R. 30 W., SW. ¼ of; on road north from Ellis ranch; iron post, marked "SIDNEY 3105"	3,104.870
Sec. 8, T. 16 N., R. 28 W., SE. ¼ of; iron post, marked "SIDNEY 3035"	3,035.205
Sec. 34, T. 15 N., R. 30 W., southeast corner of; iron post, marked "SIDNEY 2978"	2,978.133

	Feet.
Sec. 18, T. 15 N., R. 29 W., NE. ¼ of; on old stage road; iron post, marked "SIDNEY 3053"	3,053,330
Sec. 5, T. 15 N., R. 29 W., SE. ¼ of; on old stage road; iron post, marked "SIDNEY 2999"	2,999,338
Myrtle, sec. 12, T. 16 N., R. 29 W.; iron post, marked "SIDNEY 3049"	3,049.452
Sec. 24, T. 13 N., R. 31 W., on road running west from Platte River bridge; iron post, marked "SIDNEY 2833"	2,833.450
Sec. 22, T. 16 N., R. 28 W., near quarter corner south side; iron post, marked "SIDNEY 3012"	3,011.586
Sec. 13, T. 12 N., R. 29 W., NE. ¼ of; in Boxelder Canyon; iron post, marked "SIDNEY 2786"	2,785.601
Sec. 33, T. 16 N., R. 31 W., NE. ¼ of; iron post, marked "SIDNEY 3139"	3,138.549
Sec. 9, T. 16 N., R. 31 W., near center of; iron post, marked "SIDNEY 3127"	3,127.329
Sec. 22, T. 16 N., R. 29 W., east side of, near red schoolhouse; iron post, marked "SIDNEY 3038"	3,037.880
Sec. 22, T. 15 N., R. 31 W., west of schoolhouse; iron post, marked "SIDNEY 2930"	2,930.106
Sec. 3, T. 12 N., R. 31 W., NE. ¼ of; iron post, marked "SIDNEY 3028"	3,028.230
Sec. 21, T. 13 N., R. 30 W., on main road south from North Platte; iron post, marked "SIDNEY 2822	2,822.211
Sec. 2, T. 15 N., R. 28 W., NW. ¼ of, near house; iron post, marked "SIDNEY 3000"	2,999.632
Sec. 23, T. 15 N., R. 28 W., SW. ¼ of; iron post, marked "SIDNEY 2954"	2,953.659
Sec. 2, T. 14 N., R. 28 W., SW. ¼ of; iron post, marked "SIDNEY 2912"	2,911,744
Sec. 27, T. 14 N., R. 28 W., near north side of; iron post, marked "SIDNEY 2866"	2,866.912
Sec. 3, T. 13 N., R. 28 W., north side of; on Maxwell wagon road; iron post, marked "SIDNEY 2888"	2,883.475
Sec. 5, T. 12 N., R. 28 W., south end of Platte River bridge; iron post, marked "SIDNEY 2714"	2,714.485
Sec. 18, T. 12 N., R. 29 W., west of schoolhouse, on main road to North Platte; iron post, marked "SIDNEY 3056"	3,056.047
Sec. 5, T. 12 N., R. 30 W., SE. ¼ of; on main road south from North Platte; iron post, marked "SIDNEY 3037"	3,036.926
Sec. 30, T. 14 N., R. 29 W., NE. ¼ of; in valley northwest from white schoolhouse; iron post, marked "SIDNEY 2822"	2,821.754
Sec. 36, T. 17 N., R. 30 W., northwest corner of; iron post, marked "SIDNEY 3141"	3,141.424
Sec. 1, T. 17 N., R. 30 W., NE. ¼ of; ½ mile north of Clothier's house; iron post, marked "SIDNEY 3066"	3,066.100
Sec. 34, T. 17 N., R. 31 W., SW. ¼ of; near top of high hill on road from Seely post-office to Newberry's ranch; iron post, marked "SIDNEY 3183"	3,182.615
Sec. 8, T. 17 N., R. 31 W., at crossroads east of Newberry's ranch; iron post, marked "SIDNEY 3200"	3,200.253
Sec. 33, T. 18 N., R. 31 W., NW. ¼ of; on road north from Newberry's ranch; iron post, marked "SIDNEY 3232"	3,231.849
Sec. 33, T. 18 N., R. 30 W.; iron post, marked "SIDNEY 3168"	3,167.599
Sec. 34, T. 18 N., R. 29 W., near southwest corner of; iron post, marked "SIDNEY 3019"	3,019.280
Sec. 10, T. 17 N., R. 29 W., NE. ¼ of; near Mr. Chapin's house; iron post, marked "SIDNEY 2974"	2,974.350

	Feet.
Sec. 1, T. 17 N., R. 29 W., quarter corner east side of; iron post, marked "SIDNEY 2960"	2,960.470
Sec. 32, T. 18 N., R. 28 W., southeast corner of; iron post, marked "SIDNEY 2947"	2,946.832
Sec. 35, T. 18 N., R. 28 W., SW. ¼ of; iron post, marked "SIDNEY 2946"	2,945.770
Sec. 35, T. 17 N., R. 28 W., at road crossing on line between Logan and Lincoln counties; iron post, marked "SIDNEY 3002"	3,001.950
Sec. 34, T. 12 N., R. 27 W., NW. ¼ of; ½ mile north of Ericson's ranch; iron post, marked "SIDNEY 2665"	2,664.534
Sec. 9, T. 11 N., R. 27 W., NW. ¼ of; on small hill east side of road up Conroy Canyon; iron post, marked "SIDNEY 2743"	2,742.566
Sec. 29, T. 11 N., R. 27 W., near north side of; near Norlander's ranch; iron post, marked "SIDNEY 2802"	2,801.839
Sec. 5, T. 10 N., R. 27 W., NE. ¼ of; on wagon road at head of Conroy Canyon; iron post, marked "SIDNEY 2989"	2,989.333
Sec. 20, T. 10 N., R. 27 W., SE. ¼ of; near Beerley's house; iron post, marked "SIDNEY 2850"	2,850.082
Sec. 15, T. 9 N., R. 27 W., ¼ mile northwest of Hill's ranch; iron post, marked "SIDNEY 2741"	2,740.581
Sec. 34, T. 9 N., R. 27 W., on wagon road from Moorefield to Hill's ranch, near township line; iron post, marked "SIDNEY 2851"	2,850.925
Sec 1, T. 11 N., R. 28 W., NE. ¼ of; iron post, marked "SIDNEY 2769"	2,768.897
Sec. 36, T. 11 N., R. 28 W., NE. ¼ of; at Abercrombie's windmill; iron post, marked "SIDNEY 2876"	2,876.072
Sec. 12, T. 10 N., R. 28 W., NE. ¼ of; at head of Curtis Canyon; iron post, marked "SIDNEY 2934"	2,934.167
Sec. 12, T. 9 N., R. 28 W., north side of; on wagon road down Curtis Canyon; iron post, marked "SIDNEY 2738"	2,738.086
Sec. 25, T. 9 N., R. 28 W., NE. ¼ of; in Curtis Canyon; iron post, marked "SIDNEY 2678"	2,677.749
Moorefield, at railroad station; iron post, marked "SIDNEY 2826"	2,825.848
Curtis, at railroad station; iron post, marked "SIDNEY 2560"	2,560.071
Sec. 2, T. 8 N., R. 28 W., at ranch house in Curtis Canyon; iron post, marked "SIDNEY 2625"	2,624.743
Sec. 11, T. 7 N., R. 28 W., SW. ¼ of; iron post, marked "SIDNEY 2733"	2,732.561
Sec. 30, T. 7 N., R. 27 W., north side of; iron post, marked "SIDNEY 2638"	2,637.513
Stockville court-house; iron post, marked "SIDNEY 2482"	2,482.451
Sec. 24, T. 7 N., R. 27 W., on wagon road at divide between Mitchell and Medicine creeks; iron post, marked "SIDNEY 2677"	2,677.083
Sec. 1, T. 6 N., R. 28 W., northeast corner of; iron post, marked "SIDNEY 2672"	2,671.513
Sec. 4, T. 6 N., R. 27 W., NE. ¼ of, on road south from Stockville, near township line; iron post, marked "SIDNEY 2482"	2,482.453
Sec. 15, T. 8 N., R. 27 W., southwest corner of; iron post, marked "SIDNEY 2767"	2,767.453
Sec. 4, T. 7 N., R. 27 W., near northeast corner of, on wagon road between Moorefield and Stockville; iron post, marked "SIDNEY 2671"	2,671.369
Sec. 11, T. 7 N., R. 27 W., south side of, on wagon road at divide between Mitchell and Medicine Creek canyons; iron post, marked "SIDNEY 2705"	2,704.661
Ingham railroad station, near water tank; iron post, marked "SIDNEY 2679"	2,678.796

	Feet.
Sec. 3, T. 8 N., R. 25 W., on Burlington and Missouri River Railroad; iron post, marked "SIDNEY 2691"	2,691.325
Sec. 12, T. 8 N., R. 25 W., south side of, on Burlington and Missouri River Railroad; iron post, marked "SIDNEY 2687"	2,687.468
Eustis, water tank at railroad station; aluminum tablet, marked "SIDNEY 2624"	2,623.729
Sec. 17, T. 7 N., R. 26 W., southeast corner of; iron post, marked "SIDNEY 2650"	2,650.135
Sec. 12, T. 7 N., R. 26 W., southeast corner of; iron post, marked "SIDNEY 2674"	2,673.852
Sec. 15, T. 7 N., R. 25 W., southeast corner of; iron post, marked "SIDNEY 2636"	2,635.898
Sec. 13, T. 7 N., R. 25 W., southeast corner of; iron post, marked "SIDNEY 2527"	2,526.900
Sec. 6, T. 7 N., R. 24 W., quarter corner north side of; iron post, marked "SIDNEY 2668"	2,667.895
Sec. 5, T. 6 N., R. 26 W., northeast corner of; iron post, marked "SIDNEY 2551"	2,550.925
Sec. 4, T. 6 N., R. 25 W., northeast corner of; iron post, marked "SIDNEY 2592"	2,591.955
Sec. 6, T. 6 N., R. 24 W., northwest corner of; iron post, marked "SIDNEY 2563"	2,562.895
Sec. 2, T. 8 N., R. 24 W., near northeast corner of; on line between Frontier and Dawson counties; iron post, marked "SIDNEY 2743"	2,742.590
Sec. 3, T. 8 N., R. 26 W., in NE. ¼ of, Curtis ranch house, in foundation of; aluminum tablet, marked "SIDNEY 2770"	2,769.851
Sec. 10, T. 8 N., R. 26 W., quarter corner south side of; iron post, marked "SIDNEY 2818"	2,817.937
Farnam, in front of railroad station; iron post, marked "SIDNEY 2729"	2,729.024

OGALLALA TO KORTY STATION, THROUGH NORTH PLATTE, VIA UNION PACIFIC RAILROAD.

	Feet.
Roscoe; large stone in front of section house; aluminum tablet, marked "SIDNEY 3145"	3,144.678
Paxton; 10 feet east of water tank; iron post, marked "SIDNEY 3060"	3,059.554
Sutherland; Iddings's elevator, northwest corner of; iron post, marked "SIDNEY 2961"	2,960.865
Hershey; southeast corner of water tank; aluminum tablet, marked "SIDNEY 2906"	2,906.388
Spuds; stock yards, east end of; iron post, marked "SIDNEY 2852"	2,852.446
North Platte; First National Bank, foundation of front steps; aluminum tablet, marked "SIDNEY 2805"	2,805.049
Milepost 287 miles west of Omaha, ¼ mile west of; iron post marked "SIDNEY 2779"	2,779.500
Gannett; at Union Pacific signpost; iron post, marked "SIDNEY 2769"	2,769.022
Pawnee; near east end of switch; iron post, marked "SIDNEY 2747"	2,747.203
Maxwell; west end of station; iron post, marked "SIDNEY 2714"	2,714.457
Korty, 1½ miles east of; half-mile post 326½ miles west of Omaha; iron post, marked "SIDNEY 3099"	3,099.205

ROCKY MOUNTAIN SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. E. M. Douglas, geographer in charge, spirit leveling was continued for the control of the regular topographic work executed during the year in the various localities as listed below. In addition leveling was carried on in the following quadrangles during the year 1899. As the field work in these quadrangles is not yet completed the results will not be published until later.

South Dakota—Edgemont.
Colorado—Greeley and Silverton.
Arizona—Florence and Globe.
Texas—Gainesville.
Montana—Helena and Marysville.
Utah—Coalville.

TEXAS.

MONTAGUE AND COOKE COUNTIES.

MONTAGUE AND GAINESVILLE QUADRANGLES.

Commencing at a copper bolt marked "U.S.B.M." set by the United States Coast and Geodetic Survey in the United States jail at Fort Smith, Arkansas, level lines were run in various parts of the Indian Territory and Texas in 1897–98, in connection with surveys under the direction of Mr. C. H. Fitch, topographer. Two bench marks were established in Gainesville, the one being "a bronze tablet set in center of north face of top foundation stone at northeast corner of brick building on California street, near station building, and used by Tyler & Simpson as a grocery store, marked '733,' elevation 733.159." The other is "an iron post, 2 inches out of ground, 45.3 feet south of south crossing frog and in line with north and south crossing frogs of the Missouri, Kansas and Texas Railway with the Gulf, Colorado and Santa Fe Railway. It is 6.4 feet west of west rail of Missouri, Kansas and Texas and 6.8 feet east of east rail of Gulf, Colorado and Santa Fe, marked '740,' elevation 740.188."[1] These are the reference points for the following elevations:

The leveling in December, 1899, January–April, 1900, was done by Mr. E. W. Glafcke, under the general direction of Mr. E. M. Douglas, geographer.

All bench marks are marked "GAINV" in addition to figures of elevation.

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[1] Descriptions copied from Bulletin No. 175, now in course of publication by the U. S. Geological Survey.

TERRAL, INDIAN TERRITORY, TO GAINESVILLE, TEXAS, VIA CHICAGO, ROCK ISLAND AND TEXAS AND MISSOURI, KANSAS AND TEXAS RAILWAYS.

	Feet.
Terral, Indian Territory, 1 mile south of; a copper bolt in the west end of north pier of Chicago, Rock Island and Texas Railway bridge over Red River, marked "809"	808.837
Terral, Indian Territory, 1.5 miles south of; on east side of Chicago, Rock Island and Texas Railway, on vertical rail set in ground at milepost No. 523	852.45
Ringgold, 180 feet east of Missouri, Kansas and Texas Railway station, at end of platform between main tracks and switch; iron post, marked "894 GAINV"	893.991
Ringgold, 3.2 miles east of; 50 feet north of the Missouri, Kansas and Texas Railway track and 150 feet east of milepost No. 752, near railroad fence; iron post, marked "824 GAINV"	823.961
Belcher; 50 feet north of Missouri, Kansas and Texas station and 10 feet north of switch at intersection of sidewalk on main street; iron post, marked "896 GAINV"	895.948
Belcher, 3.5 miles east of; at public road crossing 6 feet north of track, east side of road; iron post, marked "853 GAINV"	852.553
Nocona, southeast corner of main street, 200 feet north of station; iron post, marked "980 GAINV"	979.660
Nocona, 3.5 miles east of; 9 rail lengths east of milepost No. 739; iron post, marked "904 GAINV"	903.442
Nocona, 6 miles east of; at public road crossing 40 feet south of track; 6 telegraph poles west of milepost 737; iron post, marked "892 GAINV"	891.502
Bonita, town of; 200 feet north of Missouri, Kansas and Texas Railway station; 15 feet north of main track at base of telegraph pole; iron post, marked "931 GAINV"	930.406
Bonita, 3 miles east of; 25 feet north of track, at milepost No. 731, public road crossing; iron post, marked "1009 GAINV"	1,008.365
Bonita, 6 miles east of; 2 poles east of milepost No. 728 on nail in base of telegraph pole, north of track	1,138.294
Saint Jo., 300 feet east of Missouri, Kansas and Texas Railway station, 10 feet south of main track near wagon road; iron post, marked "1142 GAINV"	1,141.151
Saint Jo., 3.2 miles east of; 5 telegraph poles east of mile post No. 723 and 300 feet east of bridge No. 1453, south side of railroad track, on edge of right of way along public road; iron post, marked "1166 GAINV"	1,164.942
Saint Jo., 6.2 miles east of; on east side of public road 60 feet south of Missouri, Kansas and Texas Railway track, near corner of guard fence; iron post, marked "1036 GAINV"	1,035.215
Muenster, 125 feet northeast of station in southwest corner of lumber yard on main street; iron post, marked "971 GAINV"	970.120
Myra, 300 feet north of railroad track, west side of public road, opposite and 75 feet east of post-office; iron post, marked "917 GAINV"	916.245
Lindsay, southeast corner of Pete Johnson's store building on Main street, 750 feet north of railroad track; iron post, marked "796 GAINV"	794.764

GAINESVILLE, VIA MARYSVILLE AND BULCHER, TO NOCONA.

Wolf Ridge, schoolhouse No. 77, 300 feet southeast of; at corner of fence forks of Gainesville and farmers' roads; iron post, marked "927 GAINV"	927.028
Gainesville, 10.5 miles northwest of; 12 feet south of northeast corner post of cultivated land at forks of road; 2 miles north of Wolf Ridge schoolhouse; iron post, marked "945 GAINV"	944.693

	Feet.
Gainesville, 15 feet northwest of; at lower end of Black Hollow, east side of road, near top of divide between Black Hollow and Lander Creek; iron post, marked "820 GAINV"	819.567
Marysville, 3 feet south of southwest corner of post-office on east side of main street; iron post, marked "873 GAINV"	873.286
Marysville, 3 miles northwest of; at junction of Saint Jo and Bulcher public roads, at southeast corner of rail fence around Houssinger residence; iron post, marked "916 GAINV"	916.318
Bulcher, town of; northwest corner of post-office, 40 feet south of Camp Creek on right bank; iron post, marked "746 GAINV"	746.413
Bulcher, 4.2 miles northwest of; at intersection of Illinois Bend and Saint Jo public road; southeast corner of fence west side of road (at J. E. Seitz's farm); iron post, marked "900 GAINV"	900.548
Bulcher, 7.2 miles northwest of; at A. A. Kennedy's ranch 800 feet east of house at intersection of public road and Bonita road; iron post, marked "977 GAINV"	977.249
Bulcher, 11 miles northwest of; 8 miles northeast of Nocona at junction of Nocona and Illinois Bend roads; iron post, marked "1008 GAINV"	1,008.157
Nocona, 5 miles southeast of; at left side of road at mouth of lane east of iron bridge across Farmers Creek; iron post, marked "907 GAINV"	906.764

NOCONA SOUTHWEST, VIA MONTAGUE, TO BOWIE AND RINGGOLD.

Nocona, 3 miles southwest of; east side of public road to Montague; large sandstone ledge; aluminum tablet, marked "942 GAINV"	941.971
Nocona, 6.2 miles southwest of; 500 feet due south of Dixie schoolhouse, 10 feet west of public road; 3½ miles northeast of Montague; iron post, marked "941 GAINV"	940.993
Montague; in west capstone of county court-house, south side of main entrance; aluminum tablet, marked "1076 GAINV"	1,075.066
Montague, 3.7 miles southwest of; north side of telephone road, 500 feet northwest of Patent drain farmhouse; iron post, marked "1073 GAINV"	1,072.315
Montague, 6.5 miles southwest of; north of telephone road, at turn in same; 1,000 feet east of east fork of Denton Creek; iron post, marked "1058 GAINV"	1,057.046
Suspension bridge across Denton Creek, on bolt in capstone left side; marked with white paint	1,057.16
Montague, 10.5 miles southwest of; on high mesa to right of road, ¾ mile southwest of suspension bridge, 3¾ miles from Bowie; iron post, marked "1127 GAINV"	1,126.578
Bowie; southwest corner of street at Brown Hotel; 100 feet east of Fort Worth and Denver Railroad station; iron post, marked "1124 GAINV"	1,123.264
Bowie, 2 miles northwest of; top of section of rail west of railroad track for marker at milepost No. 542	1,050.99
Bowie, 3 miles northwest of; top of section of rail on end in ground for marker at milepost 541, top of	1,014.39
Bowie, 4 miles northwest of; 40 feet east of Chicago, Rock Island and Texas Railway track, at public road crossing; 210 feet south of milepost No. 540; iron post, marked "989 GAINV"	988.839
Bowie, 5 miles northwest of; top of section of rail on end in ground at milepost No. 539	960.04
Stoneburg, 500 feet west of Chicago, Rock Island and Texas station, at northeast corner of post-office building; iron post, marked "936 GAINV"	935.740

	Feet.
Stoneburg, 1.5 miles northwest of; top of section of rail on end in ground for marker at milepost No. 534	901,184
Stoneburg, 2.5 miles northwest of; on top of section of rail on end in ground for marker at milepost No. 533	868.274
Stoneburg, 3.5 miles northwest of; top of section of rail on end in ground for marker at milepost No. 532	862.973
Stoneburg, 4.5 miles northwest of; 50 feet west of A. R. track on right of way; 50 feet south of milepost No. 531, opposite Walker's ranch; iron post, marked "876 GAINV"	875.586
Stoneburg, 5.5 miles northwest of; top of section of rail on end in ground for marker at milepost No. 530	865.210
Stoneburg, 6.5 miles northwest of; top of section of rail on end in ground for marker at milepost No. 529	869.079
Ringgold, 3 miles south of, and 7½ miles northwest of Stoneburg; intersection of public road and railroad crossing; 1,300 feet north of milepost No. 528, 46 feet east of railroad track; iron post, marked "897 GAINV".	896.016

BURNET, WILLIAMSON, TRAVIS, AND LAMPASAS COUNTIES.

BURNET QUADRANGLE.

The elevations in the following list are based on a bronze tablet marked "611.1," set at north side of steps at east entrance to City Hall at San Antonio, the assumed elevation of which is 661.112 feet. For additional elevations in this locality see Appendix to Twentieth Annual Report of the United States Geological Survey, page 440.

The leveling was done by Mr. Thomas Winsor, under the general direction of Mr. E. M. Douglas, geographer.

All bench marks are stamped "SA" in addition to the elevation in feet.

FROM MILEPOST 15 (FROM LLANO), ON AUSTIN AND NORTHWESTERN RAILROAD, ALONG PUBLIC ROAD, VIA MASON CROSSING, TO BURNET.

	Feet.
Mason Crossing, 2½ miles west of; spike in base north side of milepost No. 15 from Llano, on south side of road	979.29
Mason Crossing, 1½ miles west of; nail in root 24-inch post-oak tree, south side of road, 100 feet southwest of milepost No. 16 from Llano	953.99
Junction with road running south	938.00
Mason Crossing; west bank of Colorado River, 59 feet southwest of road at bend; iron post, marked "384 SA"	833.847
Colorado River, bed of	810.00
Mason Crossing, 1 mile east of; 1,000 feet west of Norris schoolhouse, nail in root south side 20-inch post-oak tree in middle of road	878.13
Norris schoolhouse, surface of road in front of	905.00
Mason Crossing, 2 miles east of; spike in base south side of 18-inch post-oak tree, north side of road, opposite cemetery	931.21
Mason Crossing, 2¾ miles northeast of; at junction of old Fort Mason and Marble Falls and Bluffton roads, 200 feet south of Moore's store; iron post, marked "883 SA"	882.888
Peter Creek, bed of	867.00
Mason Crossing, 3¾ miles northeast of; nail in root north side 15-inch leaning post-oak tree on south side of road	1,001.51

	Feet.
Mason Crossing, 4¾ miles northeast of; nail in root south side 27-inch post-oak tree on south side of road	1,090.56
Mason Crossing, 5½ miles northeast of; southeast side of road by a live-oak tree, 50 feet northeast of milestone "8M"; iron post, marked "1261 SA"	1,260.950
Mason Crossing, 6¾ miles northeast of; nail in root south side 16-inch live-oak tree on south side of road	1,292.99
Burnet, 6 miles west of; nail in root east side 12-inch elm tree on north side of road	1,359.99
Burnet, 5 miles west of; on south side of road by a wire fence, 6 feet west of milestone "B 5"; iron post, marked "1390 SA"	1,389.573
Burnet, 4 miles west of; nail in root north side of 14-inch black-jack tree on south side of road, utilized as a fence post	1,366.53
Burnet, 3 miles west of, 100 feet east of milestone "B 3"; nail in root south side 21-inch leaning post-oak tree on south side of road	1,352.74
Burnet, 2¼ miles west of; at junction of old Fort Mason and Burnet and Bluffton roads; iron post, marked "1403 SA"	1,402.437
Burnet, 1½ miles southwest of; on summit of hill north of Post Mountain; nail in root west side 9-inch live-oak tree on south side of road	1,419.72
Hamilton Creek, bed of	1,272.

BURNET, ALONG PUBLIC ROADS, VIA POMONA POST-OFFICE, TO NARUNA.

NORTHWARD ALONG BURNET AND LAMPASAS ROAD, POPULARLY CALLED THE "WIRE ROAD."

Burnet, school building at; southwest entrance; chiseled square at northwest end of blue limestone doorsill	1,318.84
Burnet, 1¼ miles north of; spike in telephone pole in middle of road	1,362.75
Burnet, 2 miles north of; nail in root west side 18-inch live-oak tree on east side of road	1,420.33
Burnet, 3 miles north of; 300 feet north of junction of Burnet and Lampasas, and Burnet, Brooks Mill, and Lampasas roads; by a wire fence on northeast side of road; iron post, marked "1449 SA"	1,448.946
Burnet, 4¼ miles north of; spike in west side of telephone pole at gate in front of Bullock's residence	1,407.09
Burnet, 6⅓ miles north of; on west side of road, 9 feet south of gate at Boyd's ranch; iron post, marked "1480 SA"	1,480.294
Burnet, 8 miles north of; 150 feet north of 14-inch black-jack tree utilized as fence corner post; spike in base east side of telephone pole on east side of road	1,504.62
Burnet, 9 miles north of; on west side of road, at intersection with settlement road running northwest and southeast; iron post, marked "1510 SA"	1,509.654
Burnet, 10 miles north of; at junction with settlement road running southwest; spike in base west side of telephone pole on west side of road	1,523.09
Burnet, 11 miles north of; spike in base east side of telephone pole on west side of road, utilized as fence corner post	1,464.10
Mesquite Creek, bed of	1,375.00
Naruna, 6½ miles southeast of; west side of road on summit of hill at junction of Burnet and Lampasas and Austin and San Saba roads, 700 feet northeast of Pomona post-office; iron post, marked "1466 SA"	1,465.905

NORTHWESTERLY, ALONG AUSTIN AND SAN SABA ROAD.

	Feet.
Naruna, 5½ miles southeast of; at forks of roads near Dobyville schoolhouse, 60 feet southwest of milestone "LMPS 10 M"; nail in root northeast side of 6-inch scrub live-oak tree on southwest side of road	1, 463. 46
Naruna, 4¼ miles southeast of; at junction with settlement road running north, 750 feet southeast of old railroad grade, 50 feet northwest of southwest fence corner; iron post, marked "1468 SA"	1, 468. 138
Naruna, 2½ miles southeast of; in top of limestone outcrop 20 feet north of south fence line opposite angle in road, 700 feet southeast of Littlepage's residence; bronze tablet, marked "1500 SA"	1, 499. 881
Naruna, 1¾ miles southeast of; at end of narrow lane on north side of road; nail in root south side 30-inch live oak tree utilized as a fence corner post	1, 488. 92
Junction with Burnet and San Saba road, ground at	1, 465. 00
Naruna; 170 feet southeast of Baptist church at intersection of Austin and San Saba and Llano and Lampasas roads; iron post, marked "1476 SA"	1, 475. 965

NARUNA, ALONG PUBLIC AND SETTLEMENT ROADS TO BLUFFTON.

SOUTHERLY ALONG LLANO AND LAMPASAS ROAD.

	Feet.
Naruna, 1 mile southwest of; 200 feet south of bridge over small drain; nail in root west side 9-inch post oak tree on west side of road	1, 410. 65
Naruna, 2 miles southwest of; chiseled square on limestone bowlder on west side of road at bend; blaze on cedar fence post 4 feet west	1, 421. 82
Naruna, 3 miles southwest of; in top of limestone outcrop on north side of 18-inch post oak tree in middle of lane, west side of road at bend; aluminum tablet, marked "1455 SA"	1, 455. 307
Junction with Settlement road running south	1, 506. 00

SOUTHWARD ALONG SETTLEMENT ROAD.

	Feet.
Naruna, 5¼ miles southwest of; nail in root east side 10-inch live oak tree on east side of road	1, 497. 90
Naruna, 6 miles southwest of; 80 feet west of small drain, in top of limestone outcrop, 15 feet south of road, 25 feet northwest of blazed 12-inch post oak tree; bronze tablet, marked "1457 SA"	1, 457. 240
Junction with Bluffton and Lampasas road, ground at	1, 545. 00

SOUTHWESTERLY ALONG BLUFFTON AND LAMPASAS ROAD.

	Feet.
Top of hill at 7-mile post, ground at	1, 559. 00
Naruna, 6½ miles southwest of; 70 feet north of milestone "B 7," near top of hill; nail in root southeast side 12-inch mesquite tree on northwest side of road	1, 558. 87
Bluffton, 6½ miles northeast of; 600 feet northeast of milestone "Bl 6 M;" nail in root northwest side 12-inch live oak tree on southeast side of road	1, 491. 32
Bluffton, 5⅔ miles northeast of; at milestone "B 5 M;" nail in root northwest side 16-inch dead post oak tree on southeast side of road	1, 388. 84
Bluffton, 4⅔ miles northeast of; at high point in open pasture, in top of limestone outcrop 15 feet southeast of road; aluminum tablet, marked "1399 SA"	1, 398. 845
Bluffton, 3½ miles northeast of; 700 feet northeast of gate; nail in root east side 14-inch live oak tree on east side of road	1, 318. 796
Top of hill near gate, ground at	1, 355. 00
Bluffton, 2½ miles northeast of; 300 feet south of log house; nail in root east side 10-inch mesquite tree on west side of road	1, 084. 44

	Feet.
Bluffton, 1¾ miles northeast of; 100 feet northeast of gate, 30 feet north of 6-inch blazed live oak tree, in red sandstone outcrop on rocky hillside 35 feet west of road; bronze tablet, marked "1006 SA"	1,006.004
Junction with road running north to Stevens Bend, ground at	995.00
Bluffton, ¾ mile north of; at fence corner on north bank of Colorado River; nail in root west side 26-inch elm tree on northwest side of road	948.50
Colorado River, bed of	925.00
Bluffton schoolhouse; wooden doorsill, north entry	1,000.00
Bluffton, 7 feet east of northeast fence corner at junction of Burnet and Llano and Bluffton and Lampasas roads; iron post, marked "1012 SA"	1,012.089

BLUFFTON, SOUTHEASTERLY ALONG BURNET AND LLANO ROAD TO BURNET.

Colorado River, bed of	915.00
Bluffton, 1¼ miles southeast of; northeast side of road at junction with road running northeast to McDonald's mill, 200 feet southeast of southeast bank of Colorado River; iron post, marked "948 SA"	948.134
Bluffton, 2¼ miles southeast of; nail in root northeast side 12-inch post oak tree on southwest side of road	1,033.41
Bluffton, 3¼ miles southeast of; southwest side of road at angle; nail in base northeast side 20-inch live oak tree utilized as fence post	1,195.00
Bluffton, 4¼ miles southeast of; 10 feet east of 18-inch post oak tree utilized as fence post at angle on north side of road; iron post, marked "1227 SA"	1,227.086
Bluffton, 5¼ miles southeast of; nail in root southwest side 10-inch mesquite tree on northeast side of road	1,161.62
Clear Creek, bed of	1,130.00
Bluffton, 6¼ miles southeast of; at junction with dim road running south; nail in root northeast side 21-inch post oak tree	1,181.63
Burnet, 6 miles northwest of; at junction with settlement road running west, in top of pink granite outcrop southwest side of road; aluminum tablet, marked "1285 SA"	1,285.111
Burnet, 5 miles northwest of; southwest side of road opposite farmhouse; nail in root northeast side 12-inch post oak tree	1,291.15
Burnet, 4 miles northwest of; in front of Lakeview schoolhouse; nail in root northeast side 24-inch post oak tree southwest side of road, utilized as fence post	1,295.31
Spring Creek, floor of bridge over	1,269.00
Burnet, 3 miles northwest of; nail in root south side 8-inch live oak tree on south side of road at top of hill	1,373.84

BURNET, NORTHEASTERLY ALONG BURNET, BROOKS'S MILL, AND LAMPASAS ROAD TO SAGE.

Burnet, 4 miles northeast of; nail in root southeast side 21-inch live oak tree on southeast side of road	1,368.72
Burnet, 5 miles northeast of; nail in root southeast side 16-inch live oak tree on northwest side of road	1,385.79
Burnet, 5¾ miles northeast of; west side of road at junction with settlement road running northwest, 200 feet south of summit of hill; iron post, marked "1454 SA"	1,454.129
Sage, 4 miles southwest of; spike in base of gatepost on northwest side of road	1,348.93
Glimp Creek, bed of	1,309.00
Sage, 3 miles southwest of; 200 feet west of road running north to Boyce's gin; nail in root south side 8-inch live oak tree on north side of road	1,333.09

	Feet.
Road running north to Boyce's gin, ground opposite	1,330.00
Sage, 1¾ miles southwest of; 7 feet south of fence corner at right angle bend in road, 250 feet east of Bethel schoolhouse; iron post, marked "1346 SA"	1,346.097
Top of hill at 9-mile stone, ground at	1,369.00
Sage, 250 feet south of post-office at; 75 feet south of north fork of San Gabriel River, opposite Murphy & Jenkins's gin, in top of limestone bowlder; aluminum tablet marked "1261 SA"	1,260.91

SAGE, ALONG PUBLIC ROADS VIA SUNNY LANE TO BACHELOR PEAK.

North Fork San Gabriel River, bed of	1,257.00
Intersection of Austin and San Saba road, ground at	1,274.00
Sunny Lane, summit of hill southwest of; ground at	1,272.00
South Rocky Creek, bed of	1,165.00
Sunny Lane, 250 feet southwest of post-office at; in top of embedded limestone bowlder, by wire-fence corner on north side of road, 150 feet northeast of Methodist church, at junction of Burnet, Brooks's Mill, and Lampasas and Austin roads; aluminum tablet, marked "1168 SA"	1,168.518

NORTHWARD ALONG AUSTIN AND LAMPASAS ROAD.

Sunny Lane, 2½ miles north of; south side of gate on west side of road, at junction with settlement road running northeast to Bachelor Peak; iron post, marked "1335 SA"	1,335.013

NORTHEASTERLY ALONG SETTLEMENT ROAD, VIA ELDRIDGE & FIELD'S RANCH, TO GEORGETOWN AND LAMPASAS ROAD.

Eldridge & Field's ranch, 2 miles southwest of; nail in base south side 9-inch mesquite tree on southeast side of road	1,292.59
Bachelor Peak, ½ mile southeast of; 200 feet southeast of junction with settlement road running southwest to Eldridge & Field's ranch, in top of limestone rock on southwest fence line of Georgetown and Lampasas road; aluminum tablet, marked "1260 SA"	1,259.891

BACHELOR PEAK, ALONG PUBLIC ROADS, TO JOPPA.

SOUTHERLY ALONG GEORGETOWN AND LAMPASAS ROAD.

Bachelor Peak, 1½ miles southeast of; 600 feet northwest of schoolhouse; nail in root northeast side 15-inch post-oak tree on southwest side of road	1,224.423
Bachelor Peak, 3½ miles southeast of; 220 feet northwest of bridge over small drain, in top of limestone bowlder by stone wall on northeast side of road; aluminum tablet, marked "1125 SA"	1,125.138
Drain, floor of bridge over	1,116.00
Bachelor Peak, 4½ miles southeast of; nail in root northeast side 5-inch blackjack tree on northeast side of road near top of hill	1,075.15
North Rocky Creek, bed of	933.00
Bachelor Peak, 6 miles southeast of; ½ mile southwest of North Rocky Creek, in top of embedded limestone rock, 6 feet north of gate on west side of road, at junction with settlement road running southwest; aluminum tablet, marked "1018 SA"	1,017.502

SOUTHWESTERLY ALONG SETTLEMENT ROAD THROUGH COOK'S PASTURE, THENCE SOUTHWESTERLY ALONG BURNET AND BELTON ROAD.

	Feet.
Neely's ranch, 2 miles northeast of; 150 feet southwest of yellow house; nail in root southeast side twin live-oak trees on northwest side of road	1,003.93
Neely's ranch, 1½ miles northeast of; on southeast bank of South Rocky Creek, in top of limestone ledge on northeast side of road; aluminum tablet, marked "972 SA"	971.21
South Rocky Creek, bed of	967.00
Neely's ranch, ½ mile northeast of; spike in base south side 8-inch mesquite tree utilized as fence post on north side of road	1,103.45
Neely's ranch, 2 miles southwest of; in top of embedded limestone rock, 10 feet east of gate at junction with settlement road, running south to Joppa; aluminum tablet, marked "1251 SA"	1,251.151
Joppa, 110 feet northeast of schoolhouse at; in top of limestone rock at junction of Burnet and Florence road with settlement road; aluminum tablet, marked "1106 SA"	1,106.315

JOPPA, SOUTHWESTERLY ALONG BURNET AND FLORENCE ROAD, TO BURNET.

	Feet.
North Fork San Gabriel River, bed of	1,060.00
Joppa, 1 mile southwest of; nail in root east side 10-inch mesquite tree on southeast side of road near fence corner at top of hill	1,188.41
Joppa, 2½ miles southwest of; northwest side of road by wire fence at junction with Burnet and Belton road; iron post, marked "1230 SA"	1,229.816
Intersection with Austin and Lampasas road, ground at	1,212.00
Joppa, 5½ miles southwest of; north side of road opposite rail fence dividing two cultivated fields at summit of hill; iron post, marked "1299 SA"	1,298.930
Road running south to Bertram, ground opposite	1,296.00
Road running north, ground at forks	1,288.00
Burnet, 6 miles northeast of; on top of hill, 120 feet west of 6-mile stone; spike in base southeast side 24-inch post-oak tree utilized as fence post on northwest side of road	1,317.50
Russell Fork San Gabriel River, bed of	1,267.00
Burnet, 4¾ miles northeast of; north side of road, 4 feet west of 12-inch elm tree utilized as fence corner post, on northwest bank of Russell Fork, San Gabriel River; iron post, marked "1273 SA"	1,272.781
Burnet, 3¼ miles northeast of; nail in root southeast side 10-inch mesquite tree utilized as fence post on northwest side of road, opposite 3-mile stone	1,414.13
Burnet, 2½ miles northeast of; at fence corner on southeast side of road, 300 feet northwest of farmhouse; iron post, marked "1442 SA"	1,441.717
Summit of hill, ground at	1,470.00

BLUFFTON, ALONG PUBLIC ROADS, TO TOW.

WESTWARD ALONG BURNET AND LLANO ROAD.

	Feet.
Junction with road to Kingsland, ground at	1,008.00
Settlement road running northwest, ground at forks	1,025.00
Bluffton, 1 mile west of; nail in root south side 12-inch post-oak tree on north side of road, 400 feet west of forks	1,021.21
Bluffton, 2 miles west of; at junction of Burnet and Llano and Bluffton and San Saba roads; iron post, marked "1027 SA"	1,027.113

NORTHERLY ALONG BLUFFTON AND SAN SABA ROAD.

	Feet.
Bluffton, 3 miles northwest of; nail in base east side 10-inch black-jack tree with broken top, on west side of road	998.95
Tow, 3 miles southeast of; chiseled square on sandstone outcrop on south side of road, 50 feet east of stile at fence angle on north side of road; blaze on fence post opposite	1,000.82
Tow, 2 miles southeast of; 7 miles southeast of gate on northeast side of road, at intersection of settlement road; iron post, marked "1034 SA"	1,034.126
Tow, 1½ miles south of; at junction with Llano and Lampasas road; nail in root east side 12-inch post oak tree in fork of roads	1,035.11
Tow, northeast corner of post-office at; at junction with settlement road running west, 400 feet northwest of schoolhouse; iron post, marked "1025 SA"	1,024.999

TOW, ALONG BLUFFTON AND SAN SABA ROAD, TO BOYT'S RANCH.

Junction with Llano and Lampasas road, ground at	1,027.00
Tow, 1 mile north of; opposite to dim road running northeast; nail in base east side west trunk of triple mesquite tree on west side of road	1,034.78
Tow, 2 miles north of; 50 feet east of road, 150 feet north of forks; nail in root west side 9-inch hackberry tree	1,099.39
Tow, 3 miles northwest of; nail in root south side 24-inch dead live-oak tree on north side of road	1,285.20
Tow, 3½ miles northwest of; south bank of Falls Creek, in bench of limestone bluff 3 feet above road on west side of road; aluminum tablet, marked "1166 SA"	1,166.434
Falls Creek, bed of	1,156.00
Tow, 4½ miles northwest of; nail in root east side 8-inch dead mesquite tree on west side of road	1,336.93
Tow, 5⅔ miles northwest of; nail in base northeast side 12-inch post-oak tree on northeast side of road at bend	1,367.86
Ramsey's ranch, ½ mile southeast of; nail in root north side 9-inch cedar tree utilized as fence corner post, 10 feet southwest of gate	1,306.24
Ramsey's ranch; in top of limestone bowlder 5 feet northeast of gate, 70 feet east of Ramsey's residence; bronze tablet, marked "1368 SA"	1,368.199
Ramsey's ranch, 1 mile northwest of; nail in root north side 15-inch live-oak tree on west side of road	1,385.16
Ramsey's ranch, 2¼ miles northwest of; nail in root west side 24-inch live oak tree on northeast side of road	1,368.80
Boyt's ranch, 1¾ miles southeast of; in quartz bowlder between two 20-inch live oak trees 30 feet south of road; bronze tablet, marked "1497 SA"	1,497.055
Boyt's ranch, ½ mile southeast of; 300 feet northeast of milestone "S.S. 21M;" spike in base northeast side 20-inch post-oak tree on northeast side of road	1,447.42

ALONG BURNET AND LLANO ROAD, FROM POINT 2 MILES WEST OF BLUFFTON.

Bluffton, 3 miles west of; nail in root south side 18-inch post-oak tree utilized as fence post on north side of road	1,029.68
Bluffton, 4 miles west of; nail in root south side 10-inch blackjack tree on north side of road	1,052.16
Bluffton, 5 miles west of; by rail fence at northwest corner of cultivated field on south side of road; iron post, marked "1084 SA"	1,083.971

BURNET, ALONG BURNET AND MORMAN MILL ROAD TO MORMAN MILL.

	Feet.
Burnet, 1 mile south of; 100 feet south of lane running east, nail in root east side 26-inch post-oak tree in middle of road	1,264.63
Burnet, 2 miles south of; nail in root northwest side 10-inch post-oak tree on southeast side of road	1,250.78
Burnet, 3½ miles south of; by corner of fence around cultivated field, 300 feet northwest of white farmhouse with green blinds, on east side of road; iron post, marked "1230 SA"	1,230.227
Burnet, 4 miles south of; nail in root east side 24-inch post-oak tree on west side of road, 25 feet northwest of bridge over stock run	1,182.81
Burnet, 5 miles south of; nail in root east side 18-inch live-oak tree in middle of road on top of hill	1,160.21
Hairston Creek, bed of	1,039.00
Burnet, 6 miles south of; on southeast bank of Hairston Creek, 20 feet southwest of road; iron post, marked "1044 SA"	1,044.245
Junction with road running southeast to Smithwick, ground at forks	1,093.00
Morton Mill, 2¼ miles northeast of; nail in root north side 12-inch live-oak tree in middle of road	1,094.44
Morman Mill, 1¼ miles northeast of; nail in root south side 5-inch scrub live-oak tree on northeast side of road	999.60
Morman Mill; on east side of road at junction with road running southwest to Morman Mill about 200 yards distant; iron post, marked "839 SA"	839.356

MORMAN MILL, ALONG PUBLIC ROADS TO MARBLE FALLS.

Hamilton Creek, bed of	788.00
Morman Mill, 1 mile south of; 250 feet east of schoolhouse; nail in root west side 22-inch elm tree on east side of road	788.91
Morman Mill, 2 miles south of; nail in root east side 6-inch cedar tree, on west side of road at foot of hill	798.313
Hale Spring Church, 100 feet southeast of; by picket-fence corner on southwest side of road near northeast corner of arbor; iron post, marked "750 SA"	750.415
Hale Spring Church, 1 mile south of; nail in root west side 18-inch elm tree on east side of road	727.64
Marble Falls, 4¼ miles east of; at junction with Marble Falls and Smithwick road; nail in base east side 28-inch leaning elm tree near fence corner	706.99

WESTWARD ALONG MARBLE FALLS AND SMITHWICK ROAD.

Marble Falls, 3½ miles east of; by corner of rail fence around cultivated field, 120 feet southeast of Pleasant Valley schoolhouse, on northwest side of road; iron post, marked "795 SA"	795.237
Marble Falls, 2½ miles east of; nail in root southeast side 18-inch mesquite tree on west side of road on bank of drain	818.91
Marble Falls, 1½ miles east of; nail in base west side 12-inch mesquite tree on east side of road at summit of hill	967.01

MORMAN MILL, SOUTHERLY ALONG MARBLE FALLS AND SMITHWICK ROAD TO SMITHWICK.

Marble Falls, 5 miles southeast of; by rail fence on southwest side of road, at junction of Marble Falls and Smithwick and Burnet and Morman Mill roads, about ¼ mile northeast of Pangle crossing of Colorado River; iron post, marked "732 SA."	732.247

	Feet.
Sycamore Creek, floor of bridge over	692.00
Smithwick, 4 miles northwest of; nail in base southwest side 12-inch mesquite tree on northeast side of road, 300 feet south of farmhouse	726.11
Smithwick, 3 miles northwest of; nail in root northeast side 12-inch live-oak tree on south side of road, 100 feet east of small creek	718.60
Smithwick, 2 miles northwest of; at intersection of Marble Falls and Smithwick, Marble Falls and Georgetown, and Burnet and Smithwick roads; iron post, marked "900 SA"	900.163
Smithwick, 1 mile northwest of; nail in root west side 4-inch live-oak stump on west side of road, blaze on 4-inch live-oak tree, 6 feet north	856.40
Junction with road running west, ground at forks	711.00
Smithwick, at northeast corner of post-office and store on west side of road; iron post, marked "727 SA"	727.222

SMITHWICK, ALONG PUBLIC ROADS, VIA HALL'S RANCH, TO SPANISH CREEK.

NORTHEASTERLY ALONG SMITHWICK AND BAGDAD ROAD.

Smithwick, 1 mile northeast of; nail in root southeast side 8-inch live-oak tree on southeast side of road	863.78
Smithwick, 2 miles northeast of; 300 feet east of schoolhouse; nail in root east side 14-inch live-oak tree on west side of road	837.57
Smithwick, 3 miles northeast of; 350 feet northeast of 22-mile stone; nail in root southeast side 12-inch cedar tree on southeast side of road	916.66
Hickory Creek, bed of	835.00
Smithwick, 3¾ miles northeast of; 60 feet southeast of intersection of Smithwick, Bagdad, Burnet, and Corwin roads; iron post, marked "842 SA"	842.268

SOUTHEASTERLY ALONG BURNET AND CORWIN ROAD.

Hall's ranch, 3½ miles northwest of; nail in root north side 4-inch live-oak stump on north side of road	827.81
Hall's ranch, 2½ miles northwest of; nail in root east side 12-inch live-oak tree on west side of road	862.88
Hall's ranch, 1½ miles northwest of; in top of ledge northeast side of road on east side of creek, at point where road makes horseshoe bend; aluminum tablet, marked "797 SA"	797.496
Hall's ranch, ½ mile northwest of; nail in root west side 10-inch cedar tree utilized as fence post on south side of road	843.51
Hall's ranch, ½ mile southeast of; on west bank of Spanish Creek, on northeast side of road, at junction with Burnet and Llano road; nail in root west side 15-inch live-oak tree	802.73

SPANISH CREEK, ALONG PUBLIC AND SETTLEMENT ROADS TO COW CREEK.

SOUTHEASTERLY ALONG BURNET AND AUSTIN ROAD.

Travis Peak, 3¾ miles northwest of; 10 feet south of road on top of hill; iron post, marked "1098 SA"	1,098.365
Junction with settlement road running south, ground at forks	1,040.00
Travis Peak, 2¾ miles northwest of; nail in root east side 10-inch pin-oak tree on southeast side of road at bend	893.89
Travis Peak, 1½ miles northwest of; 60 feet southeast of milestone; nail in root north side 10-inch cedar tree on south side of road	864.69
Travis Peak, 1 mile northwest of; at junction of Burnet and Austin road with settlement road running northeast to Cow Creek, 50 feet southeast of forks; iron post, marked "858 SA"	858.489

NORTHWARD ALONG SETTLEMENT ROAD UP COW CREEK.

	Feet.
Cow Creek, bed of	769.00
Travis Peak, 2 miles north of; nail in root west side 9-inch live-oak tree on east side of road at bend	851.79
Travis Peak, 3 miles north of; spike in base east side 12-inch live-oak tree on west side of road	861.15
Travis Peak, 4 miles north of; in top of limestone bowlder on southwest side of road, on west bank of Cow Creek; bronze tablet, marked "855 SA"	855.500
Travis Creek, 5 miles north of; nail in root east side 5-inch live-oak tree on west side of road	909.52
Travis Peak, 6 miles north of; nail in base east side 8-inch cedar tree on west side of road	941.82
Travis Peak, 7 miles north of; 20 feet south of road, 100 feet southeast of where road crosses Cow Creek; iron post, marked "947 SA"	947.240
Travis Peak, 8 miles north of; nail in base of cedar on north side of road on top of a small hill	1,021.80
Cow Creek, bed of	1,002.00
Junction with Smithwick and Bagdad road	1,039.00

COW CREEK, NORTHEASTERLY ALONG SMITHWICK AND BAGDAD ROAD TO WILKS'S RANCH.

Wilks's ranch, 3 miles southwest of; 300 feet northeast of junction with Cow Creek settlement road; nail in root southeast side 6-inch cedar tree on northwest side of road	1,047.33
Wilks's ranch, 2 miles southwest of; on northwest side of road at junction with settlement road running southwest, 350 feet northeast of milestone No. 16; iron post, marked "1142 SA"	1,142.169
Wilks's ranch, 1 mile southwest of; spike in base east side 6-inch gum tree 20 feet east of road	1,167.59
Junction with South Gabriel and McNew road, ground at forks	1,360.00

WILKS'S RANCH, ALONG SOUTH GABRIEL AND M'NEW ROAD TO BERTRAM.

Wilks's ranch, 600 feet north of; opposite northwest corner of cultivated field; nail in cedar stump on west side of road	1,376.88
Bertram, 7½ miles south of; in fork of roads at junction with settlement road running southeast; iron post, marked "1358 SA"	1,358.095
Bertram, 6½ miles south of; in forks of road at 7-mile stone; nail in root east side 12-inch cedar tree	1,260.64
Intersection with Austin and Burnet road, ground at	1,190.00
Bertram, 5½ miles south of; on bank of creek; nail in root southeast side 10-inch elm tree on northwest side of road	1177.08
Bertram, 4½ miles south of; spike in fence post at southwest corner of intersection with settlement lane	1,201.19
Bertram, 3½ miles south of; on west side of road and south bank of Oatmeal Creek; iron post, marked "1137 SA"	1,137.230
Oatmeal Creek, bed of	1,128.00
Junction with road running west to Oatmeal, ground at forks	1,187.00
Bertram, 2½ miles south of; spike in base southeast side 10-inch post-oak tree utilized as fence post on northwest side of road	1167.19
South Fork San Gabriel River, bed of	1,107.00
Junction with road running west to Burnet, ground at forks	1,170.00
Bertram, 1½ miles south of; nail in root west side 24-inch live-oak tree on east side of road	1,184.93

SOUTH DAKOTA—WYOMING (BLACK HILLS).

CUSTER, PENNINGTON, AND LAWRENCE COUNTIES, SOUTH DAKOTA, CROOK AND WESTON COUNTIES, WYOMING.

HERMOSA, HARNEY PEAK, DEADWOOD, SPEARFISH, NEWCASTLE, AND SUNDANCE QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the city hall building at Deadwood in 1897, and marked "4543" feet. The elevation of this point as determined from the Fremont, Elkhorn and Missouri Valley Railroad Company's bench mark is 4,543.472 feet. All bench marks depending on this datum are marked DW. See Appendix to the Nineteenth Annual Report of the United States Geological Survey, page 281, for additional elevations in this vicinity.

The work of 1898 and 1899 was by Mr. John T. Stewart, levelman; the leveling for the Harney Peak, Hermosa, and Deadwood quadrangles was under the general direction of Mr. A. F. Dunnington, topographer, and for the Spearfish, Newcastle, and Sundance quadrangles, under the general direction of Mr. W. H. Herron, topographer.

SOUTH DAKOTA.

SHERIDAN TO HILL CITY.

	Feet.
Sheridan, 0.2 mile south of; 200 feet northwest of Barthold's ranch, west side of intersection of Sheridan, Hill City, and Keystone roads; iron post, marked "DW 4601"	4,601.071
Sheridan, 3.2 miles southwest of; 100 feet south of the J. R. stamp mill, 75 feet northwest of Lambert's house, 60 feet west of intersection of roads; iron post, marked "DW 4736"	4,736.063
Hill City, 120 feet south of railroad station; in center of south end of lawn, 2 feet north of fence; iron post, marked "DW 4976"	4,976.314

HILL CITY TO KEYSTONE.

McAdam's ranch, 100 feet northwest of; south edge of road; iron post, marked "DW 4947"	4,946.959
Beardsley's ranch, ½ mile northeast of; 25 feet north of bridge over Battle Creek, granite rock east side of road; bronze tablet, marked "DW 4734"	4,733.948
Keystone; 225 feet west of south end of business street, 150 feet southwest of Nick Shoemaker's house, north side of road, bench of rock 2 by 5 feet and 3 feet higher than road; aluminum tablet, marked "DW 4340"	4,339.824

KEYSTONE TO GLENDALE, VIA HARNEY.

Harney schoolhouse, 300 feet east of; large rock 50 feet southeast of intersection of Keystone, Rockerville, and Glendale roads; bronze tablet, marked "DW 4198"	4,197.956

GLENDALE TO HAYWARD.

Glendale, 0.4 mile south of; 100 feet east of intersection of Glendale, Spokane, and Hayward roads, rock 8 by 10 feet and 3 feet high; bronze tablet, marked "DW 4244"	4,243.939

Hayward, west side of; 175 feet east of Battle Creek, 50 feet south of intersection of Glendale, Rockerville, and Hermosa roads, rock 15 by 8 feet, 3 feet high; bronze tablet, marked "DW 3812"	3,812.017

HAYWARD TO ROCKERVILLE.

Hayward, 3½ miles north of; on ridge west side of road; iron post, marked "DW 4507"	4,506.858
Rockerville, west end of; southeast side of intersection of Hill City, Keystone, and Rockerville roads; iron post, marked "DW 4369"	4,368.815

PACTOLA TO ROCKERVILLE.

Pactola; junction of road from Rapid with roads from Hill City and Silver City, 3 feet south of corner 15, M. C. 891; iron post, marked "DW 4459"	4,458.943
Harvey's ranch, 800 feet north of; on top of divide, east side of road; iron post, marked "DW 5021"	5,021.116
Wetzell's ranch, 2 miles south of; 2½ miles north of intersection of Rapid, Pactola, and Sheridan roads, 30 feet east of road on top of divide; iron post, marked "DW 5042"	5,042.143
Wetzell's ranch, 3 miles south of; 1½ miles north of intersection of Rapid, Pactola, and Sheridan roads, on top of ridge 25 feet east of road; iron post, marked "DW 4864"	4,863.968
Sheridan, 2 miles northeast of; 50 feet northeast of intersection of Sheridan, Pactola, and Rapid roads; bronze tablet set in stone 3 by 3 feet, projecting 18 inches above ground, marked "DW 4553"	4,553.081
Baker's ranch, 800 feet southeast of; north side of road; iron post, marked "DW 4495"	4,494.763

FREMONT, ELKHORN AND MISSOURI VALLEY RAILROAD BRIDGE OVER SPRING CREEK TO ROCKERVILLE.

Spring Creek, ½ mile north of; 90 feet southwest of crossing of county road and railroad; iron post, marked "DW 3326"	3,326.184
McMinn's ranch, 350 feet northeast of; northeast side of intersection of road down Spring Creek with Rapid and Hermosa road; iron post, marked "DW 3350"	3,349.923
McMinn's ranch, 1 mile west of; 25 feet north of road; copper nail in root of 18-inch elm tree	3,380.94
McMinn's ranch, 2 miles west of; northeast corner of bridge over Spring Creek; copper nail in root of 15-inch cottonwood tree	3,418.20
McMinn's ranch, 2.8 miles west of; 675 feet north of Erb's ranch, 40 feet north of road, sandstone 5 by 15 feet, 2 feet high; bronze tablet, marked "DW 3457"	3,456.987
Blair's ranch, 400 feet northwest of; 45 feet northeast of intersection of Spring Creek, Rapid, and Rockerville roads; iron post, marked "DW 3511"	3,511.026
Blair's ranch, 0.9 mile west of; north side of road; copper nail in root of 15-inch pine	3,703.53
Wright's ranch, 1 mile east of; top of divide between Spring Creek and Rockerville Gulch, north side of road; iron post, marked "DW 4329".	4,328.911
Wright's ranch, 800 feet west of; north side of road; copper nail in root of 12-inch pine	4,339.91

ROCKERVILLE TO HERMOSA, VIA M'NOWN'S, MURPHY'S, AND PETERSON'S RANCHES.

McNown's ranch, 0.5 mile northwest of; 100 feet north of road; limestone rock 6 by 2 feet outcropping in side of rocky hill, 20 feet higher than road; bronze tablet, marked "DW 4324"	4,324.300

	Feet.
McNown's ranch, 0.9 mile southeast of; 25 feet west of road; copper nail in root of 6-inch pine	4, 248. 41
McNown's ranch, 2.9 miles southeast of; 1.7 miles northwest of Murphy's or Red Earth ranch, 20 feet north of road on top of divide, sandstone, 4 by 2 feet, 15 inches high; bronze tablet, marked "DW 4063"	4, 063. 005
Murphy's ranch, 0.7 mile northwest of; 50 feet southwest of road at wire gate; copper nail in top of 3-inch pine stump	3, 758. 29
Murphy's ranch, 1 mile southwest of; 1.4 miles northwest of Peterson's ranch; 300 feet northwest of junction of roads; bank of channel at gulch; copper nail in root of 8-inch pine tree	3, 598. 79
Peterson's ranch, 0.2 mile northwest of; northeast side of junction of Rockerville road with Hayward-Hermosa road; iron post, marked "DW 3525"	3, 524. 981
Peterson's ranch, 0.8 mile south of; 100 feet northwest of the Hayward-Hermosa road ford of Battle Creek, north bank of Battle Creek; copper nail in root of 20-inch oak tree	3, 455. 47
Westfall's ranch, 800 feet south of; 60 feet northwest of wagon bridge over Battle Creek; copper nail in root of 8-inch box-elder tree	3, 407. 39
Beatty's ranch, 400 feet northwest of; west bank of Battle Creek, north side of road; 50 feet northwest of bridge; wire nail in 3-inch box-elder stump	3, 350. 87
Beatty's ranch, 0.6 mile east of; 450 feet southwest of the intersection of the Squaw Creek and Battle Creek roads; iron post, marked "DW 3349"	3, 348. 861
Hermosa, 150 feet southwest of station; 60 west of track, in southwest corner of station agent's private yard; iron post, marked "DW 3300"	3, 300. 283

GLENDALE TO FAIRBURN, VIA SPOKANE, FARMER'S, RAY'S, AND CLARK'S RANCHES.

	Feet.
Spokane, 500 feet northwest of post-office; 300 feet north of schoolhouse; granite rock 8 by 10 feet, 18 inches high, on west side of road; bronze tablet, marked "DW 4521"	4, 520. 919
Parmer's ranch, 1.6 miles southeast of; north bank of ravine 60 feet east of road, rock 3 feet high; bronze tablet, marked "DW 4086"	4, 085. 933
Ray's ranch, southwest side of; intersection of Spokane, Hermosa, and Custer roads; iron post, marked "DW 3650"	3, 649. 971
Clark's ranch, 0.3 mile east of; 350 feet north of Dry Creek, 50 feet south of cut-off road for Fairburn; iron post, marked "DW 3780"	3, 780. 514
Clark's ranch, 0.7 mile southeast of; south side of road; copper nail in root of 12-inch elm tree	3, 695. 24
Laning's ranch, 2.8 miles southeast of; top of ridge 1,000 feet east of gulch running into French Creek, north side of road; 375 feet southeast of ¼ section corner; iron post, marked "DW 3700"	3, 699. 825
Smith's ranch, 0.5 mile north of; southwest side of road crossing, 2.5 miles west of Fairburn; iron post, marked "DW 3430"	3, 429. 812
Fairburn, 200 feet northeast of station; 40 feet northeast of county road crossing; iron post, marked "DW 3310"	3, 310. 260

CLARK'S RANCH TO RICHARDSON'S RANCH, VIA HARE'S AND M'CLELLAND'S RANCHES.

	Feet.
Fay's ranch, 2½ miles northwest of; 500 feet southeast of top of ridge, white limestone 2 by 4 feet, 1 foot high, on west side of road; bronze tablet, marked "DW 4223"	4, 223. 120
Hare's ranch, 2.1 miles west of; 1 mile southwest of divide, between French Creek Ravine and Squaw Creek; granite ledge 3 feet higher than road, on west side of road; south bank of channel in ravine; bronze tablet, marked "DW 4664"	4, 664. 128

	Feet.
McClelland's ranch, 0.1 mile west of; granite ledge north of and 4 feet higher than road; bronze tablet, marked "DW 5010"	5,010.155
Richardson's ranch, 600 feet northeast of; 3½ miles from Custer; iron post, marked "DW 5187"	5,187.114

RICHARDSON'S TO MELVIN SIDING, VIA LAME JOHNNY CREEK.

Wood's ranch, 0.8 mile southeast of; 400 feet south of abandoned sawmill, 100 feet west of road; 25 feet south of rock ledge, 5 by 15 feet, 2 feet high; bronze tablet, marked "DW 5027"	5,027.191
Tinsley's ranch, 800 feet east of; granite rock, 10 feet diameter, 4 feet high, on south side of road, 300 feet west of top of divide; bronze tablet, marked "DW 5109"	5,109.136
Combe's ranch, 0.3 mile south of; on west side of road; iron post, marked "DW 4696"	4,696.281
Kenoyer's ranch, 0.6 mile east of; on north side of road, in rock 24 inches high, at point of rock outcrop 10 feet high; bronze tablet, marked "DW 4244"	4,244.087
McVey's ranch, 1.7 miles east of; 300 feet north of intersection of Fairburn, Buffalo Gap, and Custer roads; iron post, marked "DW 3862"	3,862.120
Dowe's ranch, 1.3 miles southeast of; 150 feet north of road which comes down west branch of Lame Johnny Creek, 200 feet southwest of road which comes from Fairburn, 600 feet west of intersection of roads; 1 mile southeast of Lame Johnny Creek; sandstone outcrop 60 feet long; bronze tablet, marked "DW 3745"	3,744.822
Gould's ranch, 0.4 mile northwest of; 2 feet northwest of northwest corner of sec. 21, T. 5 S., R. 7 E., on Buffalo Gap and Rapid road, 250 feet southwest of junction with road running up Lame Johnny Creek; iron post, marked "DW 3482"	3,481.972

PARKER'S RANCH TO PRINGLE, VIA HIGHLAND RANCH.

Parker's ranch, 1.8 miles west of; intersection of Custer, Buffalo Gap, and Lame Johnny Creek roads; iron post, marked "DW 4312"	4,312.060
Highland ranch, 0.4 mile northwest of; 75 feet east of intersection of Custer, Buffalo Gap, and Pringle roads, rock outcrop 4 feet wide 2 feet high; bronze tablet, marked "DW 4373"	4,373.207
Otey's ranch, 0.4 mile north of; south side of road at intersection of road to Reeve's ranch; iron post, marked "DW 4617"	4,617.114
Clinkenbeard's ranch, 300 feet southwest of; intersection of Pringle, Hot Springs, and Buffalo Gap roads.; iron post marked, "DW 4532"	4,532.109
Bowman's ranch, fork of road to; north side of road; iron post, marked "DW 4716"	4,716.183
Pringle, 0.4 mile north of; copper bolt marked "DW 4879"	4,878.955

FAIRBURN TO BUFFALO GAP VIA RICHARDSON'S, GRIMLEY'S, AND NELSON'S RANCHES.

Fairburn, 3.0 miles east of; 50 feet southeast of southeast corner sec. 28, T. 4 S., R. 8 E., 50 feet southeast of intersection of roads, 250 feet north of bridge over French Creek; iron post, marked "DW 3184"	3,183.907
Richardson's ranch, 750 feet east of; 500 feet south of north ¼ section corner of sec. 14, T. 5 S., R. 8 E., on west side of road; iron post, marked "DW 3298"	3,297.941
Richardson's ranch, 3.1 miles south of; 1.4 miles south of French Creek divide; top of ridge, 20 feet west of road; iron post, marked "DW 3179"	3,178.733

	Feet.
Grimley's ranch, 0.5 mile south and 0.5 mile east of; north of road on top of ridge; iron post, marked "DW 3021"	3,020.849
Nelson's ranch, 2.3 miles southwest of; southeast corner of sec. 21, T. 6 S., R. 8 E., 450 feet northwest of road; iron post marked, "DW 3183"	3,182.780
Buffalo Gap. 5 miles east of; southeast corner of NE. ¼ sec. 25, T. 6 S., R. 7 E; iron post, marked, "DW 3221"	3,220.695

BUFFALO GAP TO HOT SPRINGS VIA WIND CAVE RANCH.

Buffalo Gap; 120 feet east of railroad ticket office, 150 feet north of wagon road running along south side of sec. 29, T. 6 S., R. 7 E.; iron post, marked "DW 3258"	3,258.185
Wood's ranch, 600 feet southwest of; 500 feet east of bridge over Beaver Creek, 5 feet south of south fence, on large outcrop of rock, 1 foot above ground; bronze tablet, marked "DW 3365"	3,365.036
Johnson's ranch, 0.4 mile west of; 125 feet north of intersection of Buffalo Gap, Hot Springs, and Custer roads, 75 feet north of Beaver Creek; wire nail in root of 6-inch willow	3,420.52
Johnson's ranch, 1.7 miles west of; on south side of road at junction of cut-off from Buffalo Gap-Custer road, foot of a round hill having a a limestone ledge on top; iron post, marked "DW 3502"	3,502.046
Martin Valley ranch, 2.2 miles west of; south side of road; ledge of limestone 20 by 30 feet; bronze table, marked "DW 3810"	3,810.208
Wind Cave ranch, 0.5 mile southeast of; 250 feet west of intersection of Buffalo Gap road with Wind Cave-Hot Springs road; iron post, marked "DW 4158"	4,158.180
Wind Cave ranch, 3.3 miles southeast of; west side of high ridge, limestone rock on south side of road; bronze tablet, marked "DW 4233"	4,233.306
Hot Springs, 4.1 miles north of; east side of junction of Buffalo Gap and Hot Springs road with Hot Springs and Wind Cave road; iron post, marked "DW 3847"	3,847.367
Hot Springs, south entrance to county court-house; 2½ feet east of steps, in vertical face of wall 2½ feet above ground; bronze tablet, marked "DW 3462"	3,462.169

GRIMLEY'S RANCH TO 2 MILES SOUTH OF BRENNAN, VIA CHEYENNE RIVER, MORRIS'S, SMITH'S, STINGER'S, GRAMBERG'S, AND BENNETT'S RANCHES.

Harrison Flat schoolhouse, 1 mile north and 1 mile east of; southeast corner of SW. ¼ sec. 8, T. 6 S., R. 9 E.; iron post, marked "DW 2964"	2,963.793
Harrison Flat schoolhouse, 3.2 miles northeast of; 1.7 miles south of mouth of Cottonwood Creek, west side of Cheyenne River bottom where road comes down bluff; nail in 10-inch cottonwood tree	2,795.81
Cottonwood Creek, 500 feet southwest of mouth of; west side Cheyenne River bottom, south side Cottonwood Creek bottom, 50 feet southwest of junction of trails running down Cottonwood Creek; iron post, marked "DW 2775"	2,774.702
Ayres's ranch, 0.2 mile southwest of; side of Indian monument on west line of Pine Ridge Indian Reservation, 700 feet south of Cheyenne River; ¼ mile east of west corner of secs. 13 and 24, T. 5 S., R. 9 E., 150 feet north of road; iron post, marked "DW 2738"	2,737.955
Cheyenne River, bed of; at northwest corner of Pine Ridge Indian Reservation	2,728.00
Ayres's ranch, 3 miles northwest of; top of divide between French Creek and Cheyenne River, 25 feet north of road; iron post, marked "DW 3270"	3,269.781

	Feet.
French Creek, bed of; at Morris's ranch	2,992.00
Morris's ranch, 75 feet southwest of; 9 miles east of Fairburn on north side of road, north side of French Creek; iron post, marked "DW 3008".	3,007.810
Morris's ranch, 3.3 miles northwest of; about ½ mile northeast of junction of Alkali Creek with Dry Creek; 500 feet south of junction of road to Battle Creek with Dry Creek-Hermosa road; iron post, marked "DW 3076"	3,075.666
Smith's ranch, 0.5 mile north of; southeast corner of sec. 32, T. 3 S., R. 9 E., ¼ mile west of road from French Creek to Hermosa; iron post, marked "DW 3162"	3,161.678
Stinger's ranch, 1 mile southwest of; 75 feet southeast of intersection of roads to Hermosa, Battle Creek, and Cheyenne River; iron post, marked "DW 3212"	3,211.632
Stinger's ranch, 0.6 mile east of; southeast corner of NE. ¼ sec. 7, T. 3 S., R. 9 E.; iron post, marked "DW 3137"	3,136.799
Stinger's ranch, 1 mile east and 2.7 miles north of; 0.3 mile south of southeast corner of sec. 30, T. 2 S., R. 9 E., 30 feet southwest of road crossing; iron post, marked "DW 3278"	3,277.675
Vohmer's ranch, 250 feet east of; on west side of road, 725 feet south of northeast corner of sec. 7, T. 2 S., R. 9 E., 450 feet south of Spring Creek; iron post, marked "DW 3133"	3,132.695
Gramberg's ranch, 1 mile northwest of; at southwest corner of NW. ¼ sec. 31, T. 1 S., R. 9 E., 100 feet north of crossroads; iron post, marked "DW 3216"	3,215.675
Bennett's ranch, 0.7 mile northeast of; at the southeast corner of SW. ¼ sec. 17, T. 1 S., R. 9 E., 100 feet south of road; iron post, marked "DW 3155"	3,154.674
Brennan, 2 miles south of; 250 feet southeast of county road crossing, 20 feet southwest of county road, southwest corner of Getchell's ranch, 1 foot south of north quarter corner of sec. 14, T. 1 S., R. 8 E.; iron post, marked "DW 3160"	3,160.295

DWYER'S RANCH TO BULLDOG RANCH, VIA CASTLE CREEK AND COLD SPRINGS.

Jim Dwyer's ranch, 800 feet northwest of; 275 feet north of road, township corner on base line and marked "sec. 5, T. 1 N., R. 3 E., on northwest and R. 4 E., on northeast;" iron post, marked "DW 5837"	5,837.498
Slate Creek schoolhouse, 1½ miles northwest of; 25 feet northeast of intersection of Hill City and Lookout roads; copper bolt in center of east side and 1 foot below top of highest slate outcrop, marked "DW 6146".	6,145.958
Kinney's ranch, 500 feet east of; 125 feet south of bridge over Castle Creek, on Hill City road, west side of road east of Castle Creek; iron post, marked "DW 5737"	5,737.097
Reynold's ranch, 1 mile south of; intersection of Rochford, Hill City, and Castle Creek roads; iron post, marked "DW 6029"	6,029.142
Shick's ranch, ½ mile east of; 275 feet west of intersection of Rochford and Castle Creek roads, 50 feet north of road, 6 feet from highest point of outcrop, slate ledge 12 feet higher than road; copper bolt, marked "DW 6007"	6.007.081
Johnson's ranch, 700 feet northwest of; 2½ feet north of section corner on township line, 250 feet north of Castle Creek road, 60 feet west of road to Smith's ranch; iron post, marked "DW 6363"	6,363.198
Castle Creek, head of; in west side and 2 feet below top of limestone outcrop, 10 by 10 feet, 150 feet northeast of intersection of the Castle Creek, Cold Springs, and Newcastle roads; copper bolt, marked "DW 6536".	6,536.045

	Feet.
Thowell's ranch, ½ mile west of; 25 feet southwest of fork of road to Thowell's ranch; iron post, marked "DW 6769"	6,768.966
Cold Springs, 300 feet north of; in limestone ledge 15 feet higher than creek bed, 150 feet north of where Cheyenne-Deadwood road crosses creek, 100 feet west of road; ledge shows out of ground 10 feet in length and 2 feet high; copper bolt, marked "DW 6417"	6,416.999
McQuaig road, 3.7 miles west of intersection with Cheyenne-Deadwood stage road, 15 feet south of road fork; iron post, marked "DW 6539"	6,539.163
McQuaig road with Cheyenne-Deadwood road, intersection of; 2 miles west of Colton's ranch, in shelf of limestone cliff, 3 feet below top of cliff on the part farthest south and west; cliff 10 feet high and 15 feet long, 100 feet south of the road intersection; copper bolt, marked "DW 6464"	6,464.513
Bessant's ranch, 2.3 miles west of; north side of road near edge of small park; iron post, marked "DW 6547"	6,547.151
Bessant's ranch, 0.2 mile southeast of; south side of road; iron post, marked "DW 6433"	6,433.186
Fish's timber camp, 100 feet south of; 50 feet west of stable, south edge of road; iron post, marked "DW 6284"	6,284.121
Bulldog ranch, 75 feet east of track; 50 feet northwest from wagon road, 15 feet southwest of post in mound of rock, marked "U. S. L. M. 73;" bronze tablet set in top of small flat rock, marked "DW 5863"	5,862.996

SPEARFISH TO POWER'S SAWMILL SITE, VIA SPEARFISH AND BEAR GULCH ROAD.

Spearfish, water table of Star & Bullock building; bronze table, marked "DW 3647"	3,647.255
Brown's ranch, 200 feet southwest of; on south side of road; iron post, marked "DW 4224"	4,223.958
Brown's ranch, 4.1 miles southwest of; 2.3 feet north of corner common to secs. 1, 6, 31, and 36, Ts. 5 and 6 N., Rs. 1 and 2 E.; iron post, marked "DW 5131"	5,130.924
Power's sawmill site, 400 feet north of; north side of road; iron post, marked "DW 5437"	5,436.852

ELMORE TO BLOCK'S RANCH AND RETURN, VIA CHEYENNE CROSSING.

Elmore, west of section house; iron post marked "DW 5218"	5,218.416
Cheyenne crossing, 20 feet northwest of; intersection of road to Elmore with old Deadwood-Cheyenne stage road; iron post, marked "DW 5308"	5,307.930
Block's ranch, 75 feet northeast of; mouth of Deadhorse Canyon, west side of road; iron post, marked "DW 5610"	5,609.949
Block's ranch, 1.8 miles northwest of; west side of town line, 1,000 feet south of corner common to secs. 24 and 25, R. 1 E., and secs. 19 and 30, R 2 E.; iron post, marked "DW 6140"	6,139.956

WYOMING.

NEWCASTLE TO 3 MILES EAST OF NEWCASTLE, VIA ALKALI BUTTE, CRAWFORT'S RANCH, AND MOUTH OF STOCKADE BEAVER CREEK.

Newcastle, south corner of city park; south meridian mark; bronze tablet, marked "DW 4332"	4,332.098
Oil Spring, 0.5 mile southwest of; 450 feet southwest of junction of roads in Little Oil Creek, west side of road; iron post, marked "DW 4156"	4,156.041
Lang's ranch, 200 feet northeast of; south side of road; iron post, marked "DW 4006"	4,006.066

	Feet.
Lang's ranch, 2.4 miles west of; south side of road, top of small divide; iron post, marked "DW 4014"	4,014.071
Beaver Creek, bed of; at bridge 10 miles southwest of Newcastle	3,867
Lang's ranch, 4.2 miles southwest of; 60 feet west of junction of roads, 0.2 mile west of Beaver Creek bridge; iron post, marked "DW 3895"	3,895.011
Deetkin's ranch, 0.8 mile west of; 25 feet east of junction of roads; iron post, marked "DW 3994"	3,994.178
Deetkin's South Beaver Creek ranch, 0.4 mile north of; on small divide, 25 feet east of road; iron post, marked "DW 4014"	4,013.982
Deetkin's South Beaver Creek ranch, 4 miles northwest of; 25 feet northeast of road, 300 feet north of South Beaver Creek; iron post, marked "DW 4052"	4,051.982
Deetkin's South Beaver Creek ranch, 3 miles southwest of; top of ridge, 25 feet south of road; iron post, marked "DW 4199"	4,199.045
Deetkin's South Beaver Creek ranch, 5.5 miles southwest of; 25 feet west of road on small ridge; iron post, marked "DW 4352"	4,352.066
Alkali Butte, 1.3 miles southeast of; 25 feet west of junction of roads from Alkali Creek with road up Sheep Creek; iron post, marked "DW 4403"	4,403.002
Alkali Butte, 3 miles southeast of; 0.2 mile northeast of road crossing Alkali Creek, 360 feet east of creek, 25 feet east of road; iron post, marked "DW 4056"	4,056.028
Alkali Butte, 6.4 miles southeast of; 25 feet east of road; iron post, marked "DW 3972"	3,972.048
Crawfort's ranch, 0.2 mile northwest of; 75 feet northwest of junction of roads; iron post, marked "DW 3870"	3,869.902
Crawfort's ranch, 2.5 miles northeast of; top of divide between Alkali Creek and Robbers Roost Creek, 15 feet south of road; iron post, marked "DW 4039"	4,038.966
Crawfort's ranch, 6 miles northeast of; 1.1 miles southeast of where Sheep Creek road comes down from bluff, southeast point of small ridge 2,000 feet southeast of highest point of bluff; iron post, marked "DW 3965"	3,964.843
Crawfort's ranch, 7.7 miles northeast of; 6.5 miles northwest of mouth of Stockade Beaver Creek, 20 feet south of Sheep Creek road; iron post, marked "DW 3891"	3,890.917
Crawfort's ranch, 10.4 miles northeast of; 3.3 miles west of mouth of Stockade Beaver Creek, top of divide between Beaver and Sheep creeks, 5 feet south of road; iron post, marked "DW 3927"	3,927.071
Stockade Beaver Creek, 1.5 miles west of mouth of; top of small ridge, 15 feet north of road; iron post, marked "DW 3776"	3,775.958
Beaver Creek, bed of; at mouth of Stockade Beaver Creek	3,678.00
Stockade Beaver Creek, 700 feet southeast of junction with main Beaver Creek, 700 feet southeast of irrigation company's house and dam, south side of road at fence corner; iron post, marked "DW 3708"	3,707.515
Stockade Beaver Creek, 2.1 miles north of mouth of; 700 feet east of gate in wire fence, 25 feet north of road in draw; iron post, marked "DW 3789"	3,788.576
Irrigation Company's house, 0.5 mile south of; 1,200 feet south of south end of dam at lake, 3.7 miles north of mouth of Stockade Beaver Creek, 25 feet east of road; iron post, marked "DW 3843"	3,843.451
Baird's ranch, 0.5 mile east of; 13 feet west of southeast corner of NE. ¼ sec. 1, T. 42 N., R. 61 W., 20 feet west of road; iron post, marked "DW 3914"	3,914.435

	Feet.
Clifton siding, 2.7 miles northwest of; 1,000 feet northwest of center of railroad bridge over Whoop-up Canyon, 60 feet east of railroad, 30 feet west of the Edgemont-Newcastle wagon road; iron post, marked "DW 3971"	3,970.500
Clifton siding, 5.8 miles northwest of; 30 feet northwest of railroad crossing, 270 feet south of railroad bridge, at junction of road from west with Edgemont-Newcastle road; iron post, marked "DW 4043"	4,042.625
Clifton siding, 8.5 miles northwest of; 50 feet northwest of Edgemont and Newcastle railway crossing; iron post, marked "DW 4120"	4,119.595
Spencer siding, 45 feet southeast of road crossing at; iron post, marked "DW 4195"	4,194.556
Newcastle, 3 miles east of; iron post, marked "DW 4344"	4,344.202

MOUTH OF STOCKADE BEAVER CREEK TO S & G RANCH.

S & G ranch, 2.9 miles west of; 50 feet northeast of bridge over main irrigation ditch, 40 feet north of irrigation ditch; iron post, marked "DW 3683"	3,683.427
S & G ranch, 2.3 miles west of; south side of road; wire nail in root of 24-inch pine	3,799.27
S & G ranch, 1.2 miles west of; north side of road on top of ridge; wire nail in root of 15-inch pine	3,828.12
S & G ranch, 50 feet north of railway station; 50 feet east of Burlington & Missouri track; iron post, marked "DW 3704"	3,703.580

SHEEP CREEK, NORTH TO BRIDGE OVER BEAVER CREEK.

South Beaver and Main Beaver creeks, 2.8 miles west of and 0.4 mile north of junction of; center of small circular mound; iron post, marked "DW 3831"	3,831.010
Oil Creek, 2.3 miles southeast of; 8 miles northwest of mouth of Stockade Beaver Creek, 60 feet west of wagon road; iron post, marked "DW 3820"	3,819.963
Oil Creek, 0.4 mile east of mouth of; 30 feet west of junction of Main Beaver Creek road with Newcastle road; iron post, marked "DW 3829"	3,828.850
Oil Creek, 3 miles northwest of mouth of; top of low flat ridge, 20 feet east of road; iron post, marked "DW 3862"	3,861.960
Oil Creek, 6.3 miles northwest of mouth of; 0.5 mile northeast of mouth of Mush Creek, south side of low flat ridge, 20 feet east of road; iron post, marked "DW 3889"	3,889.003

OIL SPRING TO BEAVER CREEK BRIDGE, VIA JONES AND Y T RANCHES, AND OSAGE.

Kilpatrick's ranch, 0.8 mile south of; 85 feet southwest of railroad crossing, 25 feet west of wagon road; iron post, marked "DW 4171"	4,171.031
Jones's ranch, 1 mile north of; east side of Oil Canyon on east side of road, foot sandstone cliff, sandstone 6 by 15 feet, 6 feet high at west end; bronze tablet, marked "DW 4389"	4,389.057
Sundance and Osage roads, junction of; 2.3 miles southeast of Y T ranch, top of divide between Oil and Skull creeks, 25 feet south of road; iron post, marked "DW 4282"	4,282.078
Y T ranch, 10 feet north of dwelling; 60 feet west of Skull Creek, south side of road; iron post, marked "DW 4218"	4,217.956
Osage, 0.5 mile south of; 75 feet east of railroad crossing, 25 feet north of wagon road; iron post, marked "DW 4312"	4,312.018
Turner Creek, ½ mile southeast of mouth of; 1 mile east of Beaver Creek; iron post, marked "DW 4066"	4,065.929

	Feet.
Turner Creek, about 2.3 miles southeast of mouth of; 1 mile southeast of Beaver Creek Ford, 25 feet northeast of road; iron post, marked "DW 4020"	4,019.948
Beaver Creek bridge, 7.4 miles northwest of; ½ mile northeast of mouth of Fidler Creek, top of ridge, 20 feet east of road; iron post, marked "DW 4002"	4,001.914
Beaver Creek bridge, 4.4 miles northwest of; 2¼ miles southeast of mouth of Fidler Creek, 20 feet east of road; iron post, marked "DW 3973"	3,972.930

NEWCASTLE TO CAMBRIA.

Newcastle Water Company's reservoir, 0.4 mile northeast of; 4 feet northeast of railroad crossing; iron post, marked "DW 4625"	4,625.067
Cambria, west end of in canyon; 15 feet south of Kilpatrick's cottage; 125 feet west of Burlington and Missouri main track; 200 feet west of coal company's main office; iron post, marked "DW 5100"	5,099.971

THOMPSON'S RANCH, AT ANTELOPE SPRINGS, SOUTH DAKOTA, WEST TO BEAVER CREEK, WYOMING, THENCE TO SWEET & DAVIS'S SAWMILL, THENCE TO L A K RANCH VIA SALT CREEK, THENCE SOUTHEAST TO INTERSECTION OF BUCK SPRINGS AND GILLETTE CANYONS.

Thompson's ranch, 0.7 mile south of; iron post, marked "DW 6480"	6,480.210
Vail's ranch, 0.4 mile southwest of; north side of road at foot of hill, below Dakota-Wyoming State line; iron post, marked "DW 5733"	5,733.163
Thompson's ranch, 1,000 feet northeast of; 50 feet east of intersection of roads for Newcastle, Antelope Springs, and up Beaver Creek; limestone 3 by 2 feet and 6 inches high; bronze tablet, marked "DW 4788"	4,788.579
Fawcett's ranch, 0.3 mile north of; east side of road, foot of rough limestone bluff 75 feet high, limestone bowlder 4 by 4 feet and 1½ feet high; bronze tablet, marked "DW 4637"	4,637.109
Sweet & Davis' sawmill, 1.3 miles west of; 175 feet east of divide between Beaver and Salt creeks, sandstone 6 feet in diameter and 2½ feet high, on south side of road; bronze tablet, marked "DW 4601"	4,601.176
Newcastle, 3 miles east of; 75 feet west of intersection of Antelope Springs, Custer, and Newcastle roads, south side of road; iron post, marked "DW 4344"	4,344.202
L A K ranch, 75 feet east of; south side of road; iron post, marked "DW 4308"	4,308.150
L A K ranch, 3.4 miles southeast of; 340 feet northwest of intersection of road up Redbird Canyon with Newcastle and Custer road, 75 feet west of road in a rock ledge; bronze tablet, marked "DW 4487"	4,487.203
Campbell's ranch, at intersection of Buck Springs and Gillette Canyons in South Dakota; iron post, marked "DW 4727"	4,727.367

COLD SPRING, DOWN COLD SPRING CANYON TO LOST CANYON, TO HAIN'S RANCH, THENCE VIA GRAND CANYON TO RATTLESNAKE CANYON, AND OVER CEMENT RIDGE TO PRATT'S (BEAR GULCH POST-OFFICE), THENCE TO POWER'S SAWMILL.[1]

Whitman's ranch, 600 feet southeast of; 400 feet east of fork of road for McQuaig, 50 feet north of road, flat limestone rock 3 by 6 feet; bronze tablet, marked "DW 6110"	6,110.038
Whitman's ranch, bed of Cold Springs Creek at	6,091.
Hart's ranch, southwest corner of house; wire nail in end of west lower log.	5,941.09
Sawyer's ranch, 150 feet north of; 20 feet above spring, limestone ledge; bronze tablet, marked "DW 5878"	5,878.129
Fleming's ranch, 2 miles southeast of; copper nail in root of 15-inch pine tree 25 feet west of road	5,785.17

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[1] This circuit closed with an error of 1.4 feet which was distributed and the circuit not rerun.

	Feet.
Fleming's ranch, 700 feet west of; 25 feet west of road; iron post, marked "DW 5670"	5,669.856
Fleming's ranch, 1.7 miles northeast of; copper nail in root of 15-inch pine tree on west side of road	5,737.90
Fleming's ranch, 2.7 miles northeast of; rock 3 by 3 feet and 2 feet high; bronze tablet, marked "DW 5867"	5,866.724
Hain's ranch, 0.3 mile southeast of; east side of road, limestone rock 2 by 2 feet, near rocky point northwest side of intersection of three ravines; bronze tablet, marked "DW 6177"	6,177.537
Hain's ranch, 0.7 mile north of; copper nail in root of 20-inch pine tree on east side of road	6,251.61
Endicott's ranch, 0.7 mile north of; copper nail in root of 20-inch pine tree 125 feet east of road	6,163.01
Endicott's ranch, 1.8 miles north of; east side of road; iron post, marked "DW 6063"	6,062.443
Endicott's ranch, 4.3 miles north of; copper nail in root of 30-inch pine tree on north side of road	5,800.13
Simpson's ranch, 30 feet northeast of; east side of Grand Canyon, sandstone rock near foot of hill; bronze tablet, marked "DW 5740"	5,739.369
Simpson's ranch, 1.1 miles northwest of; copper nail in root of 24-inch pine tree on west side of road	5,639.20
Wood's ranch, 215 feet south of; middle of canyon, sandstone rock 2 by 4 feet and 18 inches high; bronze tablet, marked "DW 5459"	5,458.307
Wood's ranch, 1.7 miles northwest of; mouth of Rattlesnake Canyon, north side of canyon; iron post, marked "DW 5340"	5,339.181
Wood's ranch, 5.3 miles northeast of; limestone rock 8 by 6 feet and 18 inches high, north of road; bronze tablet, marked "DW 5912"	5,911.124
Wood's ranch, 5.8 miles northeast of; copper nail in top of 6-inch pine stump in channel of canyon	6,075.82
Wood's ranch, 7.1 miles northeast of; top of Cement Ridge, north of road; copper nail in root of 12-inch pine tree	6,534.51
Wood's ranch, 7½ miles northeast of; 2.1 feet southeast of closing corner of line common to Ts. 4 and 5 N., R. 1 E., on Wyoming-Dakota line, ¼ mile south of road; iron post, marked "DW 6304"	6,302.965
Wood's ranch, 7.8 miles northeast of; 200 feet north of Lone Grave; copper nail in root of 12-inch pine tree on east side of road	6,257.37
Wood's ranch, 8.5 miles northeast of; 1½ miles southeast of Welcome; 25 feet east of intersection of Welcome post-office, Bear Gulch post-office, and Cement Ridge roads; 25 feet west of State line; iron post, marked "DW 6238"	6,236.924
Fork of Nigger Hill and Bear Gulch post-office roads	6,194.5
Pratt's ranch, 1.3 miles west of; ½ mile east of Bear Gulch, intersection of Welcome, Bear Gulch, and Spearfish roads; iron post, marked "DW 5834"	5,832.912
Pratt's ranch (Bear Gulch post-office), 1,000 feet west of; 45 feet south of road, north bank of Potato Gulch, quartzite cliff; aluminum tablet, marked "DW 5836"	5,534.860
Pratt's ranch, bed of Beaver Creek at	5,505.00
Pratt's ranch, 1 mile northeast of; wire nail in root of 15-inch pine tree north of road	5,844.46

WYOMING.

SHERIDAN, BIGHORN, AND JOHNSON COUNTIES.

DAYTON, CLOUD PEAK, HYATTVILLE, AND FORT McKINNEY QUADRANGLES.

The elevations in the following list are based on a bronze tablet set in the center of the front of the city hall at Sheridan, and marked "3738." The elevation was obtained by subtracting 12 feet from the elevations determined by the Burlington and Missouri River Railroad for a bench mark at Sheridan. This correction reduces the Burlington and Missouri River Railroad elevations to the Northern Pacific Railway elevations from St. Paul, Minnesota. The elevation of the Sheridan datum was assumed to be 3,737.560 feet above mean sea level; the bench marks dependent upon this datum are stamped "SHER" in addition to the figures of elevation.

For additional elevations in this locality, see the Nineteenth Annual Report of the United States Geological Survey, page 315 of the Appendix.

The leveling was done in 1898 by Mr. C. E. Worthington, and in 1898 and 1899 by Mr. E. W. Glafcke, under the general direction of Mr. Frank Tweedy, topographer.

SHERIDAN, ALONG PUBLIC ROAD, TO DAYTON.

	Feet.
Sheridan, 2¾ miles northwest of; 20 feet east of road, in saddle on divide between Goose and Soldier creeks; iron post, marked "SHER 4087"	4,087.053
Sheridan, 5½ miles northwest of; 100 feet west of road, at corner of wire fence; ½ mile east of Keer's ranch; iron post, marked "SHER 3980"	3,979.884
Sheridan, 8.4 miles northwest of; 30 feet east of road, at corner of fence; ¼ mile west of Emmon's ranch; iron post, marked "SHER 4162"	4,161.918
Sheridan, 10.9 miles northwest of; 15 feet west of road, on divide between Soldier and Wolf creeks; iron post, marked "SHER 4423"	4,4223.976
Sheridan, 13.7 miles northwest of; 30 feet west of road in front of schoolhouse; 300 feet south of Garrard and Snyder's ranch; iron post, marked "SHER. 4109"	4,108.932
Sheridan, 16.3 miles northwest of; 20 feet west of road on divide between Wolf Creek and Tongue River; iron post, marked "SHER. 4460"	4,459.845

DAYTON, ALONG PUBLIC ROAD TO M'CULLOUGH'S RANCH.

Dayton, town of; 75 feet south of road; at corner post of wire fence; 150 feet south of Baker's store; iron post, marked "SHER. 3916"	3,916.688
Dayton, 6.7 miles west of; 10 feet north of road; ¼ mile west of Van Ness's road ranch; ¼ mile east of junction of Dayton and Parkman road; iron post, marked "SHER. 5115"	5,114.403
Dayton, 8.8 miles west of; 30 feet south of road; ½ mile southwest of divide between Columbia and Smith creeks; tablet in sandstone rock, marked "SHER. 5739"	5,739.217
Dayton, 12.7 miles west of; 15 feet south of road; ¼ mile east of triangulation station on Freezeout Mountain; bronze tablet set in rock 10 by 10 by 3 feet, marked "SHER. 7818"	7,817.984

	Feet.
Dayton, 17.5 miles west of; 15 feet south of road; 100 feet south of Granger ditch, on divide between Little Horn River and Fools Creek; iron post, marked "SHER. 7469"	7,468.987
Dayton, 24.3 miles west of; 400 feet south of road; 1 mile west of and ½ mile south of McCullough's road ranch at quarter corner between secs. 3 and 4, T. 55 N., R. 89 W.; iron post, marked "SHER. 8124"	8,123.968

M'CULLOUGH'S ROAD RANCH, ALONG PUBLIC ROAD VIA BALD MOUNTAIN CITY TO WILLOW SPRINGS.

McCullough's road ranch, 7.8 miles northwest of; 100 feet southeast of secs. 14, 15, 22, and 23, T. 55 N., R. 90 W.; 50 feet south of road; iron post, marked "SHER. 8446"	8,445.988
Little Bald Mountain, about 4 miles south of; 20 feet north of road; 300 feet east of Tongue River and 600 feet north of crossing of small stream; iron post, marked "SHER. 8670"	8,670.322
Little Bald Mountain, at the foot of; on south side at junction of Bald Mountain and Shell wagon road, 15 feet west of Bald Mountain road; iron post, marked "SHER. 9171"	9,170.992
Little Bald Mountain, on top of; ¼ mile northeast of signal station; 15 feet north of road; iron post, marked "SHER. 9829"	9,828.454
Bald Mountain City, about 2½ miles west of; on divide between Porcupine Creek and Middle Fork of Little Horn River; 20 feet south of road; iron post, marked "SHER. 9209"	9,209.015
Bald Mountain City; rock in place; aluminum tablet, marked "SHER. 8907"	8,907.184
Duncan Mountain, on top of; 3 miles north of Fortunatus mill; aluminum tablet set in side of rock 150 feet east of road; marked "SHER. 9810"	9,809.970
Duncan Mountain, 3 miles north of; on divide between drainage to Little Horn River and head of Trout Creek; 20 feet west of road; marked "SHER. 9566"	9,565.744
Duncan Mountain, 5½ miles north of; in saddle on divide between head of Lodgegrass Creek and head of Trout Creek; 1,000 feet west of Little Horn wagon road; aluminum tablet set in rock level with ground; large mound of rock 20 feet north, marked "SHER. 9327"	9,326.956
Lodgegrass Creek, spring on hill about 2 miles southwest of; on high divide 25 feet south of road; iron post, marked "SHER. 9021"	9,021.243
Lodgegrass Creek, spring on hill about 1¾ miles northeast of; on high ridge, 30 feet south of road; aluminum tablet, marked "SHER. 8600"	8,599.463
Willow Spring, about 1 mile southwest of; 25 feet south of road; about 4¾ miles from the Ed. Town ranch; iron post, marked "SHER. 7151"	7,150.811

M'CULLOUGH'S ROAD RANCH SOUTH ALONG PUBLIC ROAD TO HYATTVILLE AND SHERIDAN ROAD.

McCullough's road ranch, 1½ miles northeast of; at ¼ corner between secs. 35 and 36, T. 55 N., R. 89 W.; iron post, marked "SHER. 7885"	7,884.418
McCullough's road ranch, 5.2 miles south of; at southeast corner of sec. 12, T. 55 N., R. 89 W., 200 feet west of road; iron post, marked "8183"	8,183.366
McCullough's road ranch, 8.7 miles south of; southeast corner of sec. 12, T. 55 N., R. 89 W., 3 miles south and 1 mile east of; 25 feet east of road; 100 feet east of grove of timber; iron post, marked "SHER. 8433"	8,433.373
McCullough's road ranch, 14½ miles southwest of; on divide between South Fork of Tongue River and head of Willow Creek, about 40 feet east of wagon road and 1 mile north of crossing of South Fork of Tongue River; iron post, marked "SHER. 8915"	8,915.303

	Feet.
McCullough's road ranch, about 15 miles southwest of; 1½ miles south of crossing of south fork of Tongue River, on high ridge 40 feet east of road; aluminum tablet, marked "SHER. 9050"	9,050.357
McCullough's road ranch, about 17½ miles southwest of; on divide between two small streams and 2 miles northeast of Hyattville road, 20 feet west of road; iron post, marked "SHER. 9320"	9,320.325

LITTLE BALD MOUNTAIN, ALONG COUNTY ROAD, TO SHELL POST-OFFICE AND HYATTVILLE ROAD.[1]

Little Bald Mountain, 3 miles south of; 25 feet west of road; aluminum tablet, marked "SHER. 8957"	8,957.104
Little Bald Mountain, 5¾ miles southwest of; 20 feet east of road, 400 feet north of small stream; aluminum tablet, marked "SHER. 8939"	8,939.160
Little Bald Mountain, about 9¼ miles south of; 5 feet south of road; aluminum tablet, marked "SHER. 7917"	7,917.699
Little Bald Mountain, about 12½ miles south of; about 2¾ miles northeast of William Hunt's ranch, 10 feet south of road; aluminum tablet, marked "SHER. 6877"	6,877.688
Little Bald Mountain, 15 miles southwest of; 300 feet south of William Hunt's house; 20 feet west of road; 290 feet west and 110 feet north of quarter corner between secs. 4 and 32 on line between Ts. 54 and 55 N., R. 91 W.; aluminum tablet, marked "SHER. 5923"	5,923.239
William Hunt's ranch, 3 miles south of; 20 feet west of road in Red Canyon and about 3½ miles north of Peter Ender's ranch; iron post, marked "SHER. 5100"	5,100.595
William Hunt's ranch, 7 miles south of; at the southwest corner of Peter Ender's ranch; 15 feet east of road; 12.7 feet west of corner of secs. 32, 33, 4, and 5 on line between Ts. 53 and 54 N., R. 91 W.; iron post, marked "SHER. 4516"	4,516.655
William Hunt's ranch, 11½ miles southeast of; 2¼ miles north of Shell post-office, 600 feet west of crossing of Horse Creek on north side of road; 300 feet southwest of schoolhouse; iron post, marked "SHER. 4425"	4,426.066
Shell post-office, 400 feet east and 200 feet south of; 20 feet south and 20 feet east of wagon road; 750 feet southwest of crossing of Shell Creek, situated in the SE. ¼ of sec. 26, T. 53 N., R. 91 W.; iron post, marked "SHER. 4182"	4,183.011
Shell post-office, 3¾ miles southeast of; about ½ mile south of; Hatton ranch, 500 feet west of Trapper Creek, 20 feet west of wagon road; iron post, marked "SHER. 4443"	4,444.119
Shell post-office, 8 miles southeast of; on low divide between Trapper Creek and Red Canyon, 60 feet north of road; about 3½ miles northwest of Red Canyon Spring; iron post, marked "SHER. 5816"	5,816.964
Shell post-office, 12 miles southeast of and about 6 miles northwest of the Null Timber, 20 feet north of road; 150 feet north of Red Spring; iron post, marked "SHER. 6604"	6,604.967

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[1] There is an error of 1.5 feet in the closure of this circuit. On account of the roughness of the country the error was distributed and the circuit not rerun.

DAYTON, VIA OHLMAN AND PARKMAN TO WILLOW SPRINGS.

	Feet.
Columbus Creek, ½ mile northwest of; 15 feet east of road; northwest corner of pasture fence; iron post, marked "SHER. 4157"	4,156.772
Ohlman, 200 yards east of; northwest corner of W. Wagner's pasture at forks of road; 100 yards west of Ohlman schoolhouse and 200 yards south of Burlington and Missouri River Railroad tracks; iron post, marked "SHER. 4138"	4,137.841
Parkman, southwest corner of post-office; iron post on Main street, marked "SHER. 4292"	4,291.761
Pass, 100 yards north of old post-office and road ranch; at southeast corner of Bales's ranch; 250 yards west of Burlington and Missouri River Railroad tracks; iron post, marked "SHER. 4116"	4,115.891
Stack post-office, 1 mile northeast of; 100 yards north of East Pass Creek, inside northwest corner of fence around Powers' ranch residence; iron post, marked "SHER 4510"	4,510.292
Stack, 2 miles west of; 250 feet southwest of schoolhouse No. 19, at forks of road, and foot of divide between East and West Pass creeks, at northwest corner of fence; iron post, marked "SHER 4789"	4,789.166
West Pass Creek, 1 mile west of; on top of divide between West Pass and Gray creeks; 10 feet north of road; limestone bowlder ¾ mile south of Rose Dana's ranch house; large mound of rocks alongside; aluminum tablet, marked "SHER 5177"	5,176.851
Little Bighorn River, 3 miles southeast of; on top of divide at head of Red Gulch and forks of road; iron post, marked "SHER 5191"	5,190.749
Ed Town's ranch house, 300 feet northwest of; north side of road; iron post, marked "SHER 4453"	4,452.765
Taylor's ranch, ½ mile west of; Little Bighorn Canyon south side of pack trail; iron post, marked "SHER 4442"	4,442.082
Little Bighorn, 2 miles north of; fork of Bald Mountain and Lodgegrass road; iron post, marked "SHER 4553"	4,553.263

EAST ALONG ROAD TO COAL BANKS, VIA WYOMING-MONTANA LINE, TO A POINT 5 MILES WEST OF PASS.

Baker's ranch, 1¼ miles east of; on divide between Owl and Sixmile Creek, ¼ mile south of Montana and Wyoming boundary line, 50 feet north of road; iron post, marked "SHER 4496"	4,495.700

DAYTON, DOWN TONGUE RIVER, VIA HIGSBEE, TO SHERIDAN.

Ranchester, 3 miles west of; at forks of road to Bingham and Dayton, ½ mile north of Tongue River; iron post, marked "SHER 3839"	3,838.578
Bingham, old post-office, 150 yards northwest of; 25 feet west of road, 300 feet west of ford at Wolf Creek; iron post, marked "SHER 3887"	3,886.656
Ranchester, southeast corner McShane & Co.'s store building; iron post, marked "SHER 3751"	3,750.516
Ranchester, 3 miles east of; northeast corner of Burlington and Missouri River Railroad right-of-way fence, 35 feet north of Burlington and Missouri River Railroad, near cattle guard; iron post, marked "SHER 3698"	3,698.229
Slater Creek, 100 feet west of; at junction of crossroads, 400 feet due south of Bob Hays's ranch building and 50 feet north of crossing of Burlington and Missouri River Railroad track; iron post, marked "SHER 3660"	3,659.993
Higsbee, 1 mile north of; on divide between Goose and Day creeks, 25 feet north of road; iron post, marked "SHER 3893"	3,892.971

	Feet.
Sheridan, 3 miles east of; 5 feet to left of road, alongside Burlington and Missouri River Railroad right-of-way fence, half way between Sheridan and Higsbee; iron post, marked "SHER 3682"	3,681.802

UP SLATER CREEK TO HIDDENWATER CREEK.

Hiddenwater Creek Springs, 1 mile north of; on hill 400 feet east of road near top of divide between Hiddenwater and Ash creeks; bronze tablet in ledge of rock, mound of rock 6 feet high, 8 feet south, marked "SHER 4307"	4,306.300

SHERIDAN TO WOLF CREEK, VIA GOOSE ROAD TO BECKTON.

Sheridan, 3.2 miles northwest of; 20 feet north of road up Big Goose Creek, on south slope of bench above Big Goose Creek; iron post, marked "SHER 3870"	3,869.724
Sheridan, 6.3 miles northwest of; 50 feet west of and between forks of Owl Creek and Big Goose Creek roads at fence corner, 200 feet due east of ranch house; iron post, marked "SHER 3926"	3,925.837
Beckton, 2½ miles northeast of; 30 feet north of road at intersection of Rapid Creek and Big Goose Creek, on point of hill; iron post, marked "SHER 4015"	4,015.285
Beckton post-office, 300 yards northwest of; at northwest corner of fence, near junction of Big Goose Creek and Dayton roads; iron post, marked "SHER 4085"	4,084.997
Beckton, 2.7 miles northwest of; 200 feet south of Soldier Creek, 50 feet west of road, ¼ mile above P. K. ranch; iron post, marked "SHER 4778"	4,478.170
Beckton, 5.5 miles northwest of; 25 feet east of road, in lane; iron post, marked "SHER 4278"	4,278.081

BURNETT'S RANCH DOWN BUFFALO AND CASPER ROAD, VIA HESSE RANCH, TO TRABING POST-OFFICE, THENCE TO POINT OF BEGINNING.

T. A. ranch, ½ mile west of dwelling house; east side of lane on Buffalo and Casper stage roads; iron post, marked "SHER 4963"	4,962.165
Billy Creek, 1 mile south of; divide of Billy Creek and Poison Creek at forks of road, on edge of hill descending to drainage of Poison Creek; iron post, marked "SHER 4943"	4,942.604
Poison Creek, 1 mile south of; 60 feet east of road, top of divide between Poison and Middle forks of Crazy Woman Creek; iron post, marked "SHER 4952"	4,951.751
Fred. Hesse's ranch house, 50 feet west of; 150 feet north of middle fork of Crazy Woman Creek; iron post, marked "SHER 4776"	4,775.543
Long's ranch, 3 miles west of; on divide between middle fork and south fork of Crazy Woman Creek, 20 feet south of road, and 200 yards north of ditch; iron post, marked "SHER 4669"	4,667.944
Long's ranch, northwest corner of yard around dwelling house; 150 feet north of Crazy Woman Creek, in NW. ¼ of sec. 10, T. 47 N., R. 81 W., sixth principal meridian; iron post, marked "SHER 4511"	4,510.398
Trabing post-office, ¼ mile west of; at forks of road 30 feet north of; iron post, marked "SHER 4476"	4,475.629
Trabing, 3¼ miles northwest of; on divide between Buffalo and Douglas stage road, in T. 48 N., R. 81 W., sixth principal meridian; bronze tablet, marked "SHER 4605"	4,604.416

	Feet.
Trabing, 7½ miles northwest of; on divide between Buffalo Wallows and Crazy Woman Creek, 25 feet west of road; large sandstone bowlder; aluminum tablet, marked "SHER 4825"	4, 824. 531

FROM POINT ON PUBLIC ROAD 2 MILES SOUTHWEST OF CLOUD PEAK RANCH TO EAST TENSLEEP CREEK, VIA PUBLIC ROAD.

	Feet.
Doyle Creek, ½ mile north of; 150 feet south of Tensleep road; granite bowlder on edge of swamp	8, 474. 64
Doyle Creek, quartz bowlder on south bank; chisel marks	8, 496. 27
Doyle Creek, 1 mile west from crossing of; top of divide between Doyle Creek and Powder River drainage; granite bowlder 30 feet southwest of road; bronze tablet, marked "SHER 8812"	8, 812. 008
North Fork of Powder River, 350 feet east of public road crossing; granite bowlder 25 feet south of road; bronze tablet, marked "SHER 8548"	8, 547. 826
Powder River and Canyon Creek, on divide between; west of road in first timber north of T. G. Smith's ditch; copper nail in root of large pine tree; tree blazed and marked	8, 760. 50
Canyon Creek, divide between; copper nail in root of large pine tree 5 feet east of road	9, 040. 49
Canyon Creek, 900 feet south of crossing, on brow of hill above creek; granite ledge, mound of rock alongside, 20 feet southwest of road; bronze tablet, marked "SHER 9069"	9, 068. 557
Canyon Creek, 1 mile west of; copper nail in root of large pine tree 5 feet east of road; elevation scribed in tree and tree blazed all around	9, 086. 16
Canyon Creek, 1½ miles north of crossing; 1,000 feet south of crossing of northwest branch of Canyon Creek; granite bowlder 30 feet east of road; mound of rocks alongside; bronze tablet, marked "SHER 9212"	9, 210. 478
Tensleep drainage, east slope of; granite bowlder 40 feet east of road; mound of rocks alongside	9, 398. 68
East Tensleep lakes, about 4 miles south of; about ½ mile due south of East Fork of Tensleep Creek; top of divide overlooking Tensleep drainage; granite bowlder 20 feet west of road; mound of rocks alongside; bronze tablet, marked "SHER 9568"	9, 567. 478

FROM EAST TENSLEEP CREEK VIA TRAIL AND MUDDY PASS ROAD TO BUFFALO AND TENSLEEP ROAD.

	Feet.
Canyon Creek and Lee Creek divide, 2½ miles northwest of saddle where road crosses summit of range; large granite bowlder with mound of rocks alongside; bronze tablet, marked "SHER 9851"	9, 850. 570
Muddy Pass road, ½ mile east of intersection of, with trail to East Tensleep Lake; in saddle on summit of range; granite bowlder 300 feet north of road; bronze tablet, marked "SHER 9666"	9, 665. 664
Muddy Pass, top of; copper nail in root of large pine tree 10 feet east of road, tree blazed and scribed	9, 429. 41
Muddy Pass, 1 mile east of; granite bowlder 6 feet west of road in heavy timber, mound of rocks around same; bronze tablet, marked "SHER 8872"	8, 871. 478
Poison Creek, first park at head of; copper nail in root of large pine tree 15 feet east of road; tree blazed and marked "T. B. M."	8, 414. 79
Poison Creek, 150 feet north of; 1½ miles west of Buffalo and Hyattville stage road in open park, granite ledge 50 feet north of Muddy Pass road; mound of rocks alongside; bronze tablet, marked "SHER 8209"	8, 208. 949

FROM CLOUD PEAK RANCH TO BUFFALO AND HYATTVILLE PUBLIC ROAD AT JUNCTION OF TENSLEEP ROAD, VIA BULL CAMP MINING DISTRICT.

	Feet.
Mesa between Poison Creek and fork of Crazy Woman Creek, on granite ledge 500 feet west of road; mound of rocks alongside	7, 997. 89
Cloud Peak ranch, 3 miles south of; at Mattox Ranch; granite boulder in field 15 feet east of road; bronze tablet, marked "SHER 7885"	7, 885. 775
Bull Camp, 150 yards north of Bull Creek (a fork of Crazy Woman Creek) in the Bull Camp mining district; granite ledge with mound of rocks alongside; bronze tablet, marked "SHER 7696"	7, 696. 463
Shaft house on hill, 300 feet south of road; due south of; granite bowlder with mound of rocks alongside	7, 804. 60
Bull Camp, 3 miles southwest of; on road to Powder River; on divide between Powder River drainage and Crazy Woman drainage; granite bowlder 25 feet north of road; bronze tablet, marked "SHER 7979"	7, 979. 815
Bull Camp, 6 miles west of; along road west of Bull Camp to Powder River; limestone ledge with mound of rocks alongside, 20 feet north of point where road first gets near timber, ¼ mile west of Two Creek; bronze tablet, marked "SHER 8041"	8, 041. 554

PUBLIC ROAD FROM UNCLE BILLYS FLAT OVER POWDER RIVER AND CANYON CREEK DIVIDE, TO INTERSECTION WITH CLOUD PEAK RANCH AND TENSLEEP LAKES ROAD.

Powder River and Tensleep lakes road, 3 miles north of where road intersects Buffalo and Hyattville road; granite bowlder 125 feet west of road, on a divide between tributaries of Canyon Creek; bronze tablet, marked "SHER 8429"	8, 429. 176
Union Gulch and Powder River divide; granite boulder 15 feet west of road	8, 604. 446

PUBLIC ROAD FROM BUFFALO AND HYATTVILLE ROAD CROSSING OF POWDER RIVER TO BEARTRAP CREEK.

Uncle Billys Flat, on southeast end of; 300 feet east of road, on divide between Billy Creek and tributary of Powder River; limestone bowlder; copper bolt, marked "SHER 8049"	8, 049. 245
Beartrap Creek and Mail Cabin Creek divide, on top of; ½ mile south of Mail Cabin Creek and 1 mile north of Beartrap Creek; limestone bowlder 5 feet west of road, mound of rocks alongside; copper bolt, marked "SHER 7876"	7, 876. 506

FROM WICKWARE'S RANCH, ALONG COUNTY ROAD, TO PAINTROCK LAKES.

County road and Moccasin ranch road, ½ mile northwest of junction of; ¼ mile due west of large bunch of small pines about where road leaves cedar timber going north; behind small bushes at foot of limestone ledge on east side of road; aluminum tablet, marked "SHER 6418"	6, 417. 965
Paintrock lakes road and Rhinehart's sawmill road, junction of; in fork of roads, top of mountains; large granite bowlder; aluminum tablet, marked "SHER 8304"	8, 304. 997
Sawmill, 1½ miles northeast of; large granite bowlder 30 feet north of road on edge of small timber; trees trimmed all around point; bronze tablet, marked "SHER 8670"	8, 670. 092
Paintrock lakes, 2½ miles south of; near top of divide between drainage of Medicinelodge and Paintrock creeks, ¾ mile southwest of where road enters strip of timber; limestone ledge 20 feet east of road, mound of rock alongside; aluminum tablet marked "SHER 9309"	9, 309. 00

	Feet.
Paintrock lakes, 1½ mile southwest of; on divide between Medicinelodge and Paintrock creeks; 300 feet east of where road makes right turn from north to east; granite bowlder 10 feet north of road in edge of timber; trees trimmed and blazed all around; aluminum tablet, marked "SHER 9223"	9,223.048

FROM FORK OF BUFFALO AND SISTER HILL ROAD, NORTH VIA SISTER HILL ROAD AND FORT M'KINNEY ROAD TO BUFFALO.

	Feet.
North Fork of Crazy Woman Creek, 200 feet north of; large granite bowlder on hill 200 feet west of road, between forks of creek; aluminum tablet, marked "SHER 7714"	7,714.315
North Fork of Crazy Woman Creek, 2¼ miles north of; large granite bowlder 6 feet west of road; on west side of park at edge of timber; aluminum tablet, marked "SHER 8253"	8,253.171
Sister Hill road and corduroy road to sawmill on Sour Dough Creek, 100 feet south of junction of; ⅛ mile south of cabin at fork of Sister Hill road and Fort McKinney road; granite bowlder 30 feet east of road on east side of park mound of rocks alongside; aluminum tablet, marked "SHER 8076"	8,076.403
Sour Dough Creek, ¼ mile north of road crossing; 60 feet east of road, on side of hill draining to creek; granite bowlder; aluminum tablet, marked "SHER 7831"	7,831.070
Middle Fork of Clear Creek, 700 feet north of road crossing and 50 feet west of road; large bowlder, mound of rocks alongside; aluminum tablet, marked "SHER 7378"	7,378.220
North Fork of Clear Creek, ½ mile west of; granite ledge 60 feet north of road, large mound of rocks alongside; aluminum tablet, marked "SHER 7042"	7,042.132
Needles, 600 feet west of; 6 feet north of road, near top of grade of old military road to Fort McKinney; limestone ledge with mound of rocks alongside; aluminum tablet, marked "SHER 6476"	6,476.532
Fort McKinney, ¾ mile west of; 10 feet north of road; 500 feet north of Clear Creek; granite bowlder, mound of rocks alongside; aluminum tablet, marked "SHER 5322"	5,322.530

WYOMING—IDAHO.

UINTA COUNTY, WYOMING, AND FREMONT COUNTY, IDAHO.

MOUNT LEIDY AND GRAND TETON QUADRANGLES.

Elevations in the following list depend on the corrected elevation of a bench mark set by the Burlington and Missouri River Railroad in a preliminary railroad survey. Upon connection with the Oregon Short Line Railroad at St. Anthony, Idaho, a difference of 53.925 feet was found. To reduce these elevations to the Oregon Short Line Railroad datum, subtract this amount from each.

The leveling was done in 1897 by Mr. C. W. Beach, under the general direction of Mr. Frank Tweedy, topographer, and in 1899 by Mr. Goyne Drummond, under the general direction of Mr. T. M. Bannon, topographer.

All bench marks in Wyoming are stamped "B & M" in addition to figures of elevation. Bench marks in Idaho have not yet been stamped.

BUFFALO FORD, UP BUFFALO CREEK.

	Feet.
Buffalo Ford, north side of; 20 feet from wagon road; iron post, marked "B & M 6731"	6,731.070
Buffalo Ford, 6.4 miles northeast of; south side of Cherry's hay meadow, 400 feet from Buffalo Creek, rock 4 by 6 by 10 feet on hillside, 470 feet north of southwest corner of sec. 21, T. 45 N., R. 113 W.; copper bolt, marked "B & M 6793"	6,793.344
Buffalo Ford, 15.2 miles northeast of; in sec. 14, T. 45 N., R. 112 W., 1,000 feet north of trail, rock 2 by 3 by 3 feet; copper bolt, marked "B & M 6932"	6,931.794
Buffalo Ford, 24.2 miles northeast of; 30 feet southwest of trail, near where trail passes over rocky hill, T. 45 N., R. 111 W., copper bolt, marked "B & M 8042"	8,042.98
Buffalo Ford, 31.6 miles northeast of; ½ mile below old railroad camp, ½ mile below forks of Buffalo Creek, near edge of canyon on north side of Buffalo Creek, T. 45 N., R. 109 W.; copper bolt, marked "B & M 8108"	8,108.355
Burlington and Missouri River Railroad bench mark at station, 7109+93, marked "8696.35," corrected elevation	8,798.21

NOTE.—The correction applied is the difference between the railroad elevation and the United States Geological Survey elevation at [illegible] Wyoming, the latter being based on Northern Pacific datum at Redlodge, Montana. (See page 362 of Appendix to Eighteenth Annual Report of the United States Geological Survey.)

BUFFALO FORD TO MAYS RANCH, VIA SNAKE RIVER.

Fisher's cabin, in front of; 40 feet from road; iron post, marked "B & M 6739"	6,738.859
Cunningham's ranch, at front gate of; southeast of house; iron post, marked, "B & M 6750"	6,750.008
Cunningham ranch, 3.5 miles south of; 50 feet east of road, 600 feet northeast of quarter corner between secs. 35 and 36, T. 44 N., R. 115 W.; iron post, marked "B & M 6973"	6,973.062
Antelope Springs, 100 feet east of road; iron post, marked "B & M 6792"	6,792.082
May's ranch, ¾ mile south of; 75 feet east of road; iron post, marked "B & M 6597"	6,596.982

BUFFALO FORD TO WILSON'S STORE, VIA CAPTAIN SMITH'S RANCH AND MENORS FERRY.

Smith's ranch, northwest corner of yard; iron post, marked "B & M 6748"	6,747.648
Snake River; water level	6,732
Jackson Lake, south end of; water level	6,733.3
Smith's ranch, 3 miles southwest of; 10 feet west of road; iron post, marked "B & M 6945"	6,944.748
Smith's ranch, 6.8 miles southwest of; 60 feet north of road fork; iron post, marked "B & M 6754"	6,753.792
Smith's ranch, 11.1 miles southwest of; north mark of base line; bronze tablet, marked "B & M 6832"	6,832.303
Menors Ferry, 1 mile northwest of; 50 feet north of road, 70 feet west of signboard and road fork; iron post, marked "B & M 6497"	6,496.865
Menors Ferry; mark on Snake River, water gauge	6,448.48
Menors Ferry, 30 feet southwest of Menor's house; iron post, marked "B & M 6458"	6,457.874

	Feet.
Stewart House, 6 feet southwest of; iron post, marked "B & M 6430"	6,429.794
Miller's house, 700 feet east of; 40 feet east of corner of fence; iron post, marked "B & M 6337"	6,337.309
Miller's house, 4 miles southwest of; on line between T. 41 N. and T. 42 N., 400 feet southwest of a house, 80 feet north of road fork; iron post, marked "B & M 6247"	6,247.042
Wilson's store, 2 feet west and 3 feet south of northwest corner of; copper tablet, marked "B & M 6143"	6,143.028
Snake River at Wilson's store; water level	6,150

CAPTAIN SMITH'S RANCH NORTH ALONG JACKSON LAKE.

Smith's ranch, 3.8 miles northwest of; 325 feet north of Pilgrim Creek; iron post, marked "B & M 6914"	6,913.863
Smith's ranch, 9 miles northwest of; southeast corner of yard of Sargent's old ranch; iron post, marked "B & M 6890"	6,889.646
Jackson Lake; water level	6,733.5
Smith's ranch, 11 miles northwest of; 25 feet east of road, 300 feet west of a house; iron post, marked "B & M 6758"	6,757.863
Smith's ranch, 13.5 miles northwest of; 25 feet west of road, 60 feet northwest of signboard; iron post, marked "B & M 6797"	6,797.509

KRONER'S RANCH TO BUFFALO FORK, VIA GROS VENTRE RIVER, FISH CREEK, TWOGWOTEE PASS, AND BLACKROCK CREEK.[1]

Kroner's ranch, 12 miles northeast of; 20 feet east of trail, sandstone rock 8 by 8 by 8 feet, 1 mile north of a cabin; bronze tablet, marked "B & M 7521"	7,520.874
Kroner's ranch, 15.2 miles northeast of; mouth of small gulch 1¼ miles below fork of Fish Creek, east side of trail, sandstone rock 5 by 5 by 5 feet; copper bolt, marked "B & M 7715"	7,715.367
Kroner's ranch, 18.2 miles northeast of; 70 feet west of creek at rocky point, 800 feet north of creek where trail leads up creek, rock 4 by 4 by 1 feet; copper bolt, marked "B & M 7867"	7,867.209
Kroner's ranch, 21.9 miles northeast of; 60 feet west of creek, 600 feet north of fork of creek, 30 by 30 by 12 inches; copper bolt, marked "B & M 8186"	8,185.976
Kroner's ranch, 25.4 miles northeast of; at head of creek, 25 feet north of Fish Creek, sandstone rock 3 by 3 by 1 feet; copper bolt, marked "B & M 8615"	8,615.714
Kroner's ranch, 28 miles northeast of; top of divide between Fish Creek and Blackrock Creek, rock 2 by 2 by 5 feet; copper bolt, marked "B & M 9611"	9,611.134
Twogwotee Pass, 1.5 miles east of; 50 feet south of road, 700 feet west of small marsh where road enters timber, rock 12 by 24 by 18 inches; copper bolt, marked "B & M 9354"	9,354.397
Kroner's ranch, 32.2 miles northeast of; rock 8 by 8 by 8 inches above ground, 20 feet south of road; copper bolt, marked "B & M 9658"	9,658.593
Kroner's ranch, 31.5 miles northeast of; rock 5 by 8 by 8 feet, 5 feet west of road, ¼ mile south of point where road enters timber; copper bolt, marked "B & M 9204"	9,205.011
Twogwotee Pass, top of; 1.5 miles from forks of creek, 60 feet north of road, limestone rock 5 by 10 by 10 feet; copper bolt, marked "B & M 8653"	8,653.224

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[1] An error of 0.7 feet distributed in this line.

	Feet.
Kroner's ranch, 43 miles northeast of; 400 feet west of round hill, 60 feet west of road, rock 6 by 8 by 12 feet; bronze tablet, marked "B & M 7776"	7,777.141

MAY'S RANCH TO WILSON'S STORE, VIA GLIDDEN'S RANCH.

Gros Ventre River; water level	6,383
Glidden's house, 100 feet east of; iron post, marked "B & M 6371"	6,371.114
Moses Giltner's yard, northwest corner of; iron post, marked "B & M 6213"	6,213.220

GLIDDEN'S RANCH TO CLUBHOUSE, VIA EMERY'S RANCH.

Glidden's ranch, 3.2 miles southwest of; 200 feet north of ford on Flat Creek, 3 feet southeast of corner Ts. 41 N. and 42 N., Rs. 115 W. and 116 W.; iron post, marked "B & M 6324"	6,323.574
Emery's yard, in northwest corner of; iron post, marked "B & M 6449"	6,449.311
Clubhouse, 50 feet southeast of; iron post, marked "B & M 6241"	6,241.032

WILSON'S STORE TO RIGBY'S RANCH, AT WYOMING AND IDAHO STATE LINE, VIA TETON PASS AND VICTOR.

Lockwood's house, 20 feet west of; bronze tablet, marked "B & M 6381"	6,380.760
Teton Pass, 30 feet north of road; iron post, marked "B & M 8429"	8,428.616
Curtis house, 2 feet west of; bronze tablet, marked "B & M 7242"	7,241.971
Idaho-Wyoming line, 8 feet north of road; bronze tablet, marked "B & M 6681"	6,681.480
Spencer's house, 30 feet west of; 20 feet east of road, 250 feet north of Moses Creek; bronze tablet	6,475.600
Victor, Idaho, northeast corner of Porter's store; iron post	6,205.482
Chapin's house, 60 feet east of; iron post	6,143.989
Chapin's ranch, 2.0 miles northwest of; 100 feet north of channel of Darby Creek, 20 feet east of road; iron post	6,122.508
Drigg's house, 40 feet east of; iron post	6,097.109
Rigby's house, 1,000 feet northwest of; milepost 192, Wyoming-Idaho line; iron post	6,402.050

DRIGG'S TO TETON BRIDGE, VIA KIMBALL'S AND SWANNER'S RANCHES.

Kimball's house, 1,150 feet southwest of; iron post	6,105.643
Swanner's yard, northeast corner of; iron post	5,974.058

DRIGG'S TO CANYON CREEK, VIA TETON BRIDGE AND MILK CREEK.

Drigg's ranch, 3.5 miles north of; 80 feet east of new house; iron post	6,156.221
Lathron's house, 50 feet east and 300 feet south of ford, east of southwest corner of sec. 28, T. 6 N., R. 45 E., north side of road; iron post	6,062.617
Teton bridge, 400 feet east of; 6 feet from northwest corner of Alex. West's house; iron post	5,930.155
Teton bridge, 3.4 miles northwest of; top of divide between Teton River and Milk Creek; iron post	6,192.880
Teton bridge, 5.4 miles northwest of; 20 feet west of Milk Creek, 600 feet south of road fork; iron post	6,069.842
Teton bridge, 7.9 miles northwest of; top of divide between Milk Creek and Canyon Creek, 300 feet southwest of dugway out of Milk Creek; bronze tablet	6,022.286
Harris ranch, 3 miles northeast of; 30 feet north of road; iron post	5,906.069
Harris house, 10 feet northeast of; iron post	5,639.454
St. Anthony, Oregon Short Line Railroad bench mark, 120 feet to the left of station 1956 + 50; railroad elevation corrected to sea level 5,010.49; United States Geological Survey elevation	4,956.565

PACIFIC SECTION OF TOPOGRAPHY.

In this section, under the direction of Mr. Richard U. Goode, geographer in charge, spirit leveling was continued for the control of the regular topographic work executed during the year in the various localities, as follows:

IDAHO.

KOOTENAI COUNTY.

Cœur d'Alene Quadrangle.

The elevations in the following list are based on an aluminum tablet in the top of the latitude pier in the grounds of the county court-house at Spokane, Washington, determined to be 1,890.954 feet above mean sea level.

The leveling was done by Mr. M. P. Page, levelman, under the general direction of Mr. Van. H. Manning, topographer.

Errata occur in the published elevations in the Appendix to the Twentieth Annual Report, pages 496 and 497, for which the following are substitutes:

	Feet.
Spirit Lake, 200 feet east of landing, 15 feet south of road; iron post marked "2490 S"	2,489.993
Fish Lake, ¼ mile east of south end, 80 feet south of fork of roads; iron post marked "2366 S"	2,365.708

HAUSER JUNCTION, VIA NORTHERN PACIFIC RAILWAY, TO CŒUR D'ALENE.

Hauser Junction, 2 miles southeast of; spike in milepost 2	2,147.92
Hauser Junction, 3 miles southeast of; spike in milepost 3	2,159.10
Post Falls, 150 feet south of woolen mill, 200 feet east of bridge over Spokane River, 100 feet west of railroad spur, in large bowlder 20 feet south of road; aluminum bolt, marked "2147 S"	2,147.303
Post Falls, ¾ mile east of; spike in milepost 5	2,165.17
Post Falls, 1¾ miles east of; spike in milepost 6	2,193.37
Post Falls, 2½ miles east of; 40 feet northwest of road crossing, 30 feet north of track, 200 feet southwest of house; spike in telegraph pole	2,200.91
Post Falls, 3⅔ miles east of; road crossing north and south; ground	2,163
Post Falls, 4 miles east of; 20 feet south of track, 420 feet west of milepost 8; spike in pine stump	2,147.82
Post Falls, 6 miles east of; 500 feet south of track, 8 feet southwest of telegraph pole; iron post, marked "2148 S"	2,147.696
Post Falls, 7¾ miles east of; 25 feet north of track, 10 feet east of road at road crossing; spike in telegraph pole	2,225.81
Post Falls, 8¾ miles east of; 20 feet east of road, 200 feet northeast of road crossing; spike in pine tree	2,174.77
Cœur d'Alene, corner of Sherman and Fourth streets, in southeast corner of Merriam Building, 2 feet above sidewalk and 1 foot from door; aluminum tablet marked "2157 S"	2,157.404
Cœur d'Alene Lake, at Johnson's boat landing; spike in cottonwood tree in water, at surface, May 20, 1899	2,130.6

	Feet.
Cœur d'Alene Lake, surface of, May 23, 1899	2,130.0
Cœur d'Alene Lake, surface of, July 3, 1899	2,128.2
Cœur d'Alene Lake, surface of, July 24, 1899	2,123.6
Cœur d'Alene Lake, surface of, August 5, 1899	2,122.5
Cœur d'Alene Lake, surface of, August 23, 1899	2,121.5
Post Falls, surface of Spokane River at dam, August 23, 1899	2,119.6

CŒUR D'ALENE, VIA KING'S RANCH, TO RAMSEY.

Cœur d'Alene, 1 mile north of; 20 feet west of road, 200 feet southwest of house; spike in pine stump	2,234.19
Cœur d'Alene, 2 miles north of; 30 feet east of road, 200 feet northeast of road forks; spike in pine tree	2,234.86
Cœur d'Alene, 3½ miles north of; 40 feet north or fork of roads; spike in gate post	2,253.77
Cœur d'Alene, 4½ miles north of; 40 feet northeast of road crossing 80 feet southwest of schoolhouse, near corner of secs. 13, 14, 23, and 24, T. 51 N., R. 4 W.; spike in pine tree	2,280.10
Cœur d'Alene, 5¼ miles north of, at northwest corner of secs. 4, 12, 13, and 14, T. 51 N., R. 4 W.; spike in gatepost	2,311.38
Cœur d'Alene, 6¼ miles north of, 30 feet south of crossroads, at corner of secs. 1, 2, 11, and 12, T. 51 N., R. 4 W.; spike in top of pine stump	2,313.63
Cœur d'Alene, 7¼ miles north of; spike in pine tree, being a bearing tree to secs. 1, 2, 35, and 36, Ts. 51 and 52 N., R. 4 W	2,329.23
Cœur d'Alene, 8¼ miles north of; 30 feet west of road at edge of timber; spike in pine tree	2,315.81
Cœur d'Alene, 9½ miles north of; 3 feet west of road; spike in root of pine stump 36 inches diameter	2,284.93

CŒUR D'ALENE TO FERNAN LAKE.

Fernan Lake, 15 feet north of; 200 feet east of Fernan's house; + on stone 20 by 30 by 20 inches	2,133.16
Fernan Lake, surface of, August 18, 1899	2,129.03

RATHDRUM, VIA TELEPHONE ROAD, TO CŒUR D'ALENE BRANCH OF NORTHERN PACIFIC RAILWAY, 2.5 MILES EAST OF POST FALLS.

Rathdrum, 1 mile south of, 25 feet east of road, 130 feet west of house, near telephone pole; tack point in stake	2,214.29
Rathdrum, 2¾ miles south of, corner common to secs. 12, 7, 13, and 18, T. 51 N., Rs. 4 and 5 W.; + on stone at foot of telephone pole	2,255.57
Rathdrum, 3¾ miles south of, 20 feet northwest of crossroads, 300 feet northeast of Thornton's barn, corner common to secs. 13, 18, 24, and 19, T. 51 N., Rs. 4 and 5 W.; iron post, marked "2241 S"	2,241.333

HAUSER JUNCTION, VIA COUNTY ROAD, TO HAYDEN LAKE.

Hauser Junction, 1¼ miles east of; at northeast corner of fence; spike in fence post	2,132.84
Hauser Junction, 2 miles east of; spike in fence post southeast of corner of secs. 20, 21, 29, and 28, T. 51 N., R. 5 W	2,153.16
Hauser Junction, 3 miles east of; spike in signpost at crossroads at corner to secs. 21, 22, 27, and 28, T. 51 N., R. 5 W	2,157.08
Hauser Junction, 4 miles east of; spike in post southeast from corner of secs. 22, 23, 26, and 27, T. 51 N., R. 5 W	2,205.95

	Feet.
Hauser Junction, 5 miles east of; + on stone set for corner of secs. 23, 24, 25, and 26, T. 51 N., R. 5 W	2,231.43
Corner to secs. 17, 18, 19, and 20, T. 51 N., R. 4 W.; spike in post	2,252.98
Corner to secs. 16, 17, 20, and 21, T. 51 N., R. 4 W.; spike in fence post northeast of	2,270.25
Corner to secs. 15, 16, 21, and 22, T. 51 N., R. 4 W.; 30 feet southeast of; iron post, marked "2293 S"	2,292.764
Corner to secs. 14, 15, 22, and 23, T. 51 N., R. 4 W.; 30 feet northeast of; spike in fence post	2,297.52
Hayden Lake, 40 feet west of; 200 feet east of gate to King's ranch; nail in pine tree	2,261.50
Hayden Lake, surface of, August 10, 1899	2,242.8
Hayden Lake, surface of, August 29, 1899	2,242.7
Hayden Lake, surface of, October 10, 1899	2,241.4

ALONG LINE BETWEEN TOWNSHIPS 51 AND 52 NORTH TO HAYDEN LAKE.

Corner to secs. 5, 6, 31, and 32, Ts. 51 and 52 N., R. 4 W.; spike in fence post near	2,236.14
Corner to secs. 4, 5, 32, and 33, Ts. 51 and 52 N., R. 4 W.; spike in fence post near	2,267.36
Corner to secs. 3, 4, 33, and 34, Ts. 51 and 52 N., R. 4 W.; stone at	2,313.91
Corner to secs. 2, 3, 34, and 35, Ts. 51 and 52 N., R. 4 W.; spike in fence post near	2,303.19
Corner of Ts. 51, and 52 N., Rs. 3 and 4 W.; iron post, marked "2424 S"	2,423.55
Corner to secs. 5, 6, 31, and 32, Ts. 51 and 52 N., R. 3 W.; nail in root of tamarack stump	2,565.45
Quarter corner to south ½ sec. 33, T. 52 N., R. 3 W., 30 feet east of; spike in root of a fir tree	2,464.96
Hayden Lake, 100 feet west of; 3 feet east of trail; + on stone	2,329.55

FROM CORNER TO SECTIONS 4, 5, 31, AND 32, TOWNSHIPS 51 AND 52 NORTH, RANGE 3 WEST, TO HUDLOW'S RANCH ON HAYDEN LAKE.

Rim Rock schoolhouse, 300 feet northwest of; 60 feet north of road; spike in tamarack stump	2,518.69
Rim Rock schoolhouse, 1.5 miles east of; 120 feet southeast of Howard's house and 60 feet northeast of barn; nail in tamarack stump	2,803.90
Hudlow's ranch, 25 feet northeast of house, 600 feet north of Hayden Lake; iron post, marked "2267 S"	2,267.346

CŒUR D'ALENE, VIA FRENCH GULCH, TO KELLEY'S RANCH.

Cœur d'Alene, 2 miles northeast of; 30 feet north of road and 50 feet west of bridge; nail in root of tamarack stump	2,295.89
French Gulch; summit of hill east of; 10 feet north of road and 50 feet southeast of house; nail in root of pine stump	2,521.42
Kelley's ranch; 60 feet southwest of gate; 8 feet north of road; nail in top of fir stump	2,192.46

WEST END OF SPIRIT LAKE, ALONG TRAIL TO BRICKEL'S CABIN.

Spirit Lake, 1 mile west of; 30 feet west of log cabin, 60 feet east of creek, and 5 feet north of trail; nail in root of fir tree 24 inches in diameter	2,455.57
Brickel's cabin, 20 feet southeast of the southeast corner of; 2 miles west of Spirit Lake; 150 feet north of creek; nail in root of fir tree 10 inches in diameter	2,475.57

SCHOOLHOUSE AT EAST END OF EIGHTMILE PRAIRIE AND TWO MILES SOUTH OF RAMSEY, EAST, VIA COUNTY ROAD, TO PEND OREILLE LAKE.

	Feet.
Schoolhouse at east end of "Eightmile Prairie," 100 feet west of; 250 feet east of Northern Pacific Railway; iron post, marked "2385 S"	2,385.00
Schoolhouse at east end of "Eightmile Prairie," 1.2 miles east of; 10 feet south of road, 60 feet west of crossroads; nail in root of pine stump	2,353.05
Schoolhouse at east end of "Eightmile Prairie," 2 miles east of; 10 feet north of road at top of hill; nail in root of pine tree	2,432.17
Schoolhouse at east end of "Eightmile Prairie," 4 miles east of; 250 feet northwest of sawmill, 140 feet northwest of house; iron post, marked "2465 S"	2,465.108
Schoolhouse at east end of "Eightmile Prairie," 4¾ miles east of; 15 feet north of road; nail in root of pine tree	2,467.40
Pend Oreille Lake, 1 mile west of; 7 feet south of road; nail in root of pine tree	2,398.29
Pend Oreille Lake, 8 feet east of road; 9 feet south of corner of fence; nail in root of cottonwood tree 10 inches in diameter	2,070.59
Pend Oreille Lake, surface of, September 22, 1897	2,055.00

COLLIN'S RANCH, ALONG ROAD, AND LEIBERG TRAIL TO CHILCO MOUNTAIN.

	Feet.
Collin's ranch, 2½ miles east of; 20 feet south of fork of roads; nail in root of fir tree 12 inches in diameter	2,642.73
Collin's ranch, 3½ miles east of; 4 feet north of trail at its beginning, 100 feet south of creek; iron post, marked "2684 S."	2,683.991
Chilco triangulation station, 1 mile southwest of; on top of divide between Leiberg Creek and Iron Gulch; iron post, marked "4944 S"	4,944.00

RAMSEY, VIA SENEAGUOTEEN AND RATHDRUM ROAD, TO SHEEP SPRINGS.

	Feet.
Ramsey, 1 mile north of; 30 feet west of road; nail in root of pine tree	2,352.80
Ramsey, 2¼ miles north of; 20 feet east of road; nail in root of tamarack stump	2,372.71
Ramsey, 2¾ miles north of; 10 feet west of road, 100 feet west of fork of roads; iron post, marked "2424 S"	2,424.129
Ramsey, 4 miles north of; 6 feet east of road; nail in root of pine stump	2,457.24
Ramsey, 4⅓ miles north of; 30 feet west of fork of roads, 5 feet west of road; nail in root of pine tree	2,439.72
Ramsey, 5 miles north of; 40 feet north of road, 60 feet northeast of fork of roads; nail in root of pine tree	2,436.99
Ramsey, 5¾ miles north of; 25 feet northeast of crossroads; iron post, marked "2491 S"	2,490.949
Ramsey, 7½ miles north of; 30 feet west of road; nail in root of pine	2,520.88
Ramsey, 8 miles north of; 40 feet west of road; nail in root of pine	2,544.70
Ramsey, 9½ miles north of; 6 feet east of road; nail in pine tree	2,492.50
Ramsey, 10¼ miles north of; 30 feet west of road; nail in root of fir tree	2,484.05
Sheep Springs, 200 yards southwest of; 15 feet north of road; nail in root of fir tree	2,485.74

CŒUR D'ALENE, VIA WOLF LODGE, TO FOURTH OF JULY CANYON.

	Feet.
Cœur d'Alene, 1¼ miles east of; 60 feet northwest of house, 60 feet north of lake; tack in root of pine tree	2,161.78
Cœur d'Alene, 2¾ miles southeast of; 60 feet southwest of fork of roads; + on stone 30 by 20 by 12	2,503.92

	Feet.
Cœur d'Alene, 3 miles southeast of; 45 feet south of road at summit of hill; iron post marked "2691 S."	2,691.365
Cœur d'Alene, 3½ miles southeast of; 20 feet south of road, 700 feet southeast of house; nail in stump	2,638.20
Cœur d'Alene, 4½ miles southeast of; 60 feet east of creek, 10 feet north of road; nail in fir tree	2,545.29
Cœur d'Alene, 6⅜ miles southeast of; 5 feet north of road, 50 feet east of fork of roads; nail in fir tree	2,162.31
Cœur d'Alene, 7¼ miles southeast of; 1,000 feet southeast of house, 5 feet south of road; nail in pine stump	2,504.46
Cœur d'Alene, 7¾ miles southeast of; 40 feet southeast of fork of roads at summit of hill; nail in pine tree	2,717.59
Wolf Lodge, 60 feet west of Johnson's house in yard; 200 feet east of Wolf Lodge Creek ford; iron post, marked "2155 S."	2,154.522
Wolf Lodge, 1¼ miles east of; 5 feet north of road, 300 feet north of drain; nail in root of fir tree	2,338.46
Wolf Lodge, 2⅜ miles southeast of; 5 feet north of road on summit of hill; nail in pine stump	2,703.85
Thompson's telephone station, 100 feet south of house, 8 feet north of road; nail in tamarack stump	2,682.55
Thompson's, ¾ mile southeast of; 10 feet south of road; nail in root of fir stump	2,866.60
Thompson's, 2¼ miles southeast of; surface of water at creek crossing	2,852.00
Fourth of July Canyon, on top of divide between it and Cedar Creek, 40 feet north of road; iron post, marked "3136 S."	3,136.451

HARRISON, VIA LINE OF OREGON RAILROAD AND NAVIGATION COMPANY, TO LANE.

Harrison, base of fence around residence of M. Ribstene, in sixth tier of stone wall; aluminum tablet, marked "2207 S"	2,206.520
Milepost 437, spike in	2,134.74
Anderson, spike in whistle post east of	2,137.93
Milepost 438, spike in	2,134.94
Milepost 439, spike in	2,135.83
Medimont, spike in milepost 441	2,139.49
Milepost 442, spike in	2,135.83
Milepost 444, spike in	2,136.84
Lane, 600 feet southeast of post-office and station, 40 feet north of house, in granite bowlder 24 by 36 by 40; aluminum bolt, marked "2153 S"	2,153.082

LEN LANDING, VIA BELLGROVE, TO STATE LINE.

Len Landing, ½ mile southwest of; 25 feet north of spring house, 8 feet south of road; nail in root of tamarack	2,289.04
Len Landing, 1 mile southwest of; 10 feet north of road; nail in root of fir tree	2,529.86
Len Landing, 2⅛ miles southwest of; 6 feet south of trail on summit of mountain; nail in root of pine	3,071.87
Len Landing, 3¼ miles southwest of; 6 feet south and 100 feet west of cross roads; nail in root of fir tree	2,502.31
Bellgrove, 1 mile south of; 20 feet east of an old deserted cabin, 100 feet north of fork of roads; iron post, marked "2411 S."	2,411.494
Bellgrove, 1½ miles south of; 150 feet east of schoolhouse; nail in root of pine stump	2,546.56

	Feet.
Bellgrove, 2 miles southwest of; 5 feet west of road, 20 feet south of fork of roads; nail in root of fir tree	2,464.05
Bellgrove, 3 miles west of; 70 feet south of creek, 300 feet south of house; nail in root of fir stump	2,475.42
Three Pine Springs, 150 feet northeast of forks of roads; nail in root of three pines	2,666.70
Three Pine Springs, 1¼ miles west of; 20 feet south of road at summit of hill; nail in root of fir tree	2,753.04
Three Pine Springs, 2 miles west of; 50 feet south of road on Indian Reservation boundary line; nail in root of pine stump	2,642.83

BELLGROVE, VIA MICA BAY, TO POST FALLS.

Bellgrove, ⅞ mile north of; 15 feet east of road at summit of divide, 600 feet north of B. F. Williams's house; iron post, marked "2585 S."	2,584.872
Bellgrove, 2⅛ miles north of; 24 feet north of creek, 500 feet southeast of barn, 20 feet east of fence; nail in root of fir tree	2,330.71
Bellgrove, 2¾ miles north of; 60 feet west of creek; nail in root of white pine	2,289.82
Bellgrove, 3 miles north of; 5 feet north of trail, 15 feet west of creek crossing; nail in root of fir tree	2,193.21
Bellgrove, 4⅓ miles north of; 5 feet west of trail, 40 feet east of creek; nail in root of fir tree	2,165.27
Bellgrove, 5 miles north of; 3 feet west of road, 20 feet southeast of house; nail in root of pine tree	2,152.50
Bellgrove, 5¾ miles north of; 100 feet south of house; + on rock 20 by 10 by 7 inches	2,149.41
Mica Bay, 20 feet northwest of center of crossroads, 300 feet southeast of house; nail in root of fir stump	2,134.97
Mica Bay, ¾ mile north of; 20 feet northwest of fork of roads; + on stone 36 by 24 by 18 inches	2,471.07
Mica Bay, 1¼ miles north of; 10 feet west of forks of roads on summit of hill; nail in root of pine tree	2,570.82
Quarter corner to secs. 4 and 5, T. 49 N., R. 4 W., 30 feet east of; iron post, marked "2578 S."	2,577.670
Cougar Creek, 500 feet north of; 30 feet southwest of fork of roads; nail in root of tamarack tree	2,173.99
Cougar Creek, 1 mile northwest of; 110 feet southeast of cabin, 3 feet north of barn; nail in root of pine stump	2,422.32
Cougar Creek, 2 miles northwest of; 12 feet south of road on summit of divide between Spokane River and Cougar Creek, 800 feet north of cabin; iron post, marked "2810 S."	2,810.436
Cougar Creek, 3 miles northwest of; 15 feet southeast of creek, 15 feet west of fork of roads; nail in root of tamarack stump	2,407.35
Spokane River, ½ mile south of; 25 feet southeast of fork of roads; nail in root of pine tree	2,138.94
Post Falls, 1½ miles southeast of; 15 feet south of ferry over Spokane River; nail in root of pine tree	2,121.09
Cœur d'Alene, 7½ miles southeast of; 4.5 miles east of Echo Bay, on summit of highest round-top point, in stone 20 by 20; aluminum bolt, marked "4440 S."	4,440.00
Skalan triangulation station, 10 miles southwest of Cœur d'Alene, on summit of high round-top bald peak, in rock 2 by 1; copper bolt, marked "5250 S."	5,250.00

	Feet.
Cœur d'Alene, 10 miles northeast of summit of high round-top burnt point at head of Wolf Lodge Creek, in large bowlder; aluminum bolt, marked "4851 S."	4,851.00
Rathdrum, 3 miles north of; on high round-top burnt peak known as "Rathdrum Bald," in bowlder; aluminum bolt, marked "4970 S."	4,970 00
Hayden Lake, 5½ miles east of high round-top burnt point, in rock; aluminum bolt, marked "5026 S."	5,026.00
Chilco triangulation station; copper bolt, marked "5625"	5,625.00

CALIFORNIA.

SAN BERNARDINO COUNTY.

SAN GORGONIO QUADRANGLE.

The elevations in the following list are a continuation of those published in the Appendix to the Twentieth Annual Report relating to Hesperia and Deep Creek quadrangles. They are based on a bronze tablet in the southwest foundation of the court-house in San Bernardino, the elevation of which was accepted as 1,047.758 feet.

The leveling was done under the general direction of Mr. E. T. Perkins, jr., topographer, by Messrs. C. R. Smith, R. A. Hamilton, and C. C. Ward, levelmen.

JUNCTION OF ROADS FROM HESPERIA AND VICTOR TO RABBIT SPRINGS, VIA BEAR VALLEY AND HOLCOMB VALLEY ROADS TO GREENLEAD MINING CAMP.

	Feet.
Junction of Hesperia and Victor roads to Rabbit Springs; iron post, marked "3010 S. B."	3,010.180
The Box "S" Ranch, in front of dwelling house; iron post marked "2935 S. B"	2,935.596
The Box "S" Ranch, 6¼ miles southeast of, at east end of watering trough called Box Springs; iron post, marked "3550 S. B."	3,549.549
Cushenburg; on nail in top edge of south end of watering trough	4,042.38
Cactus Flat; at northeast corner of picket fence in front of James Johnson's residence; + on embedded square stone monument	5,878.31
Cactus Flat, 1 mile southeast of, where road to Rosemine branches off to the south; iron post, marked "6031 S. B."	6,031.196
Cactus Flat, 2.2 miles south from, at head of Baldwin grade; on embedded quartz bowlder east side of road	6,891.00
Gold Mountain, in front of shaft of the Baldwin mine; + on quartz outcropping east side of road	7,286.04
Gold Mountain, 2.6 miles west of, on east side of road, at summit before dropping down into Holcomb Valley; in nail head in big mountain cedar tree	7,538.56
Gold Mountain, 4.1 miles west of, 50 feet north of road at stamp mill of J. B. Osborne; on nail head in front of mountain cedar tree	7,339.53
Holcomb Valley, in front of offices of Holcomb Valley Mining Company; iron post, marked "7239 S. B."	7,239.428
Holcomb Valley, on east side of first road summit west of; on nail head in foot of mountain mahogany tree	7,321.17
Holcomb Valley, second road summit west of; on apex of embedded white quartz rock south side of road	7,536.17

	Feet.
Holcomb Valley, third summit west of; on nail head in front of pine tree south side of road	7,544.35
Holcomb Valley, fourth summit west of; on nail in foot of mountain mahogany tree on east side of road	7,627.97
Greenlead Mining Camp, forks of road at; on nail in foot of big pine tree	7,016.47
Greenlead Mining Camp, first road summit west of; on mountain mahogany tree north side of road	7,347.19

HOLCOMB VALLEY TO FAWNSKIN VALLEY.

Holcomb Valley, 1.7 miles southeast of, on summit of road at head of Polique Canyon; on nail in foot of pine tree north side of road	7,534.64
Holcomb Valley, 3 miles southeast of; on nail in pine tree 6 feet west of road	6,900.05
Holcomb Valley, 3.5 miles southeast of; where west branch of Polique Canyon road joins Bear Valley road to San Bernardino; iron post, marked "6761 S. B."	6,761.279
Holcomb Valley, 4 miles south from, 100 feet south of Bear Valley road, 20 feet north from high-water line of Bear Valley reservoir; nail in foot of big pine tree	6,725.02
Bear Valley reservoir, high-water mark of	6,722.00
Fawnskin Valley, upper end of, where Holcomb Valley road forks to the northeast; iron post, marked "7211 S. B."	7,211.364
Fawnskin Valley, 2 miles north from, on north side of Holcomb Valley road; on nail in large pine log	7,730.29
Holcomb Valley, 2¼ miles west and south of, on Fawnskin road summit on the north slope of De Lamar Hill; on nail in foot of big black pine north side of road	7,893.00
Holcomb Valley, 1.5 miles west and south of, where Fawnskin road passes over summit of first spur of De Lamar Hill; on nail in small pine tree west side of road	7,606.44

BAIRDSTOWN, VIA ROSE MINE AND OLD WOMANS SPRINGS, TO CUSHENBERRY.

Bairdstown, ¾ mile south of, just northwest of Dry Lake; nail in fence post at northeast corner of fence	6,739.12
Bairdstown, 3 miles southeast of, 10 feet south of road; nail in root of large juniper tree	6,731.61
Baldwins Lake, about ¾ mile east of, at junction of road from Rose mine to Bear Valley with road to Bairdstown, in road forks; iron post, marked "6773 S. B."	6,772.815
Bairdstown, at second road summit east of, on south side of road; nail in small fir tree	6,798.41
Arrastra Creek, at summit of road east of, south side of road; nail in piñon tree	6,631.02
Arrastra Creek, at second road summit east of, east side of road; nail in fir tree	6,685.08
Arrastra Creek, 2 miles east of, at road summit; embedded rock surrounded with stones	6,866.02
Rose mine, at southeast corner of cook house; iron post, marked "6867 S. B."	6,866.997
Rose mine, ¼ mile east of, at summit, south side of road; nail in foot of juniper tree	6,908.12
Rose mine, 2½ miles east of, at highest point of road where it climbs north side of Rattlesnake Canyon; nail in piñon tree	6,231.29
Mound Springs, on summit of mound above, in Rattlesnake Wash, 5 miles east of Rosemine; surface of ground	5,449.00

	Feet.
Campbells Mills, in front of cabin; nail in small piñon tree	4, 638. 27
Old Womans Springs, 3.5 miles southeast of, east side of road where it leaves Rattlesnake Wash and turns to northwest across flat; on large embedded rock	3, 665. 48
Old Womans Springs, 3.5 miles south of, on west side of road 400 feet north of where it leaves Rattlesnake Canyon and runs north toward springs; iron post, marked "3659 S. B."	3, 659. 145
Old Womans Springs, ¾ mile east of, at mouth of canyon; chiseled cross on embedded rock surrounded with stones	3, 234. 89
Old Womans Springs, 40 feet south of house, 4 feet from cottonwood tree 1 foot in diameter, surface of ground; iron post, marked "3186 S. B."	3, 185. 944
Old Womans Springs, ¾ mile west of, east side of road on summit; on black rock surrounded with stones	3, 338. 74
Old Womans Springs, 2¾ miles west of, at south base of mountain; chiseled cross in front of large upright rock	3, 511. 66
Old Womans Springs, 3¾ miles west of, south side of road on summit; cross on rock surrounded with stones	3, 605. 18
Old Womans Springs, 4.5 miles west of, at north side of road where it goes between two small hills; on rock surrounded with stones	3, 564. 16
Old Womans Springs, 4.5 miles west of, on north side of road, opposite junction with road to southeast, where road goes between two small hills; iron post, marked "3565 S. B."	3, 564. 912
Old Womans Springs, 6¼ miles west of, south side of road, at junction of Cushenberry and Black Hawk mine road; on large rock surrounded with stones	3, 759. 13
Cushenberry, 1¾ miles east of, west side of road at summit; on rock surrounded with stones	4, 236. 68
Cushenberry, 1.5 miles east of, north side of road; chiseled cross on rock	4, 249. 59

WHITEWATER RAILROAD STATION, VIA CHUCK WARREN'S AND THE PIPES, TO ROSE MINE.

Whitewater, 1⅜ miles north of, about 200 feet south of crossing of irrigation ditch, near forks of road, on pipe line to station; on top of vertical iron pipe	1, 333. 28
Whitewater, 1⅞ miles northeast of; bed of Whitewater River at ford	1, 327. 00
Whitewater, 2 miles northeast of, at foot of steep grade on north side of road; point within chiseled circle on top of embedded granite bowlder surrounded by rocks	1, 324. 10
Whitewater, about 2.5 miles northeast of, in saddle on divide between Whitewater River and Mission Creek; road	1, 503. 00
Whitewater, 3¼ miles northeast of; south side of road, about 65 feet east of dry wash of creek running from Painted Hills southeast to Mission Creek; point within chiseled circle on top of black granite bowlder 3 feet in diameter	1, 373. 61
Whitewater, 4⅞ miles northeast of; south side of road on west side of Mission Creek Valley; point within chiseled circle on top of granite bowlder 2.5 by 6 by 4 feet	1, 371. 78
Whitewater, 7⅜ miles northeast of; at right of road at junction with road from Palm Springs railroad station, and with road to Hog Ranch; point within chiseled circle on top of granite bowlder 2 by 2 by 3 feet	1, 523. 04
Mission Creek, between channels of; 175 feet east of remains of old cabin, 30 feet right of road; point within chiseled circle on top of granite bowlder	1, 595. 86

	Feet.
Dry Morongo, on west side of canyon at junction of, with Mission Creek Valley, 15 feet west of road junction, surface of ground; iron post, marked "1800 S. B."	1,799.875
Chuck Warren's ranch, 1¾ miles southwest of; on south bank of Dry Morongo, 40 feet west of where road leaves it and begins climb over divide to Chuck Warren's ranch on Big Morongo; bench cut in butt of black willow tree 10 inches in diameter	2,364.86
Summit of divide between Dry and Big Morongos; road	2,644.00
Warren's ranch, 1¼ miles southwest of; 70 feet northeast of summit of divide, 15 feet south of road; nail in bench cut in butt of iron wood 6 inches diameter	2,640.99
Warren's ranch, northeast corner of barn; ground	2,503.00
Warren's ranch, at gate post; 110 feet south of barn; iron post, marked "2504 S. B."	2,503.899
Warren's ranch, 1.5 miles northeast of; 10 feet left of road; point within chiseled circle on top of granite bowlder 1.5 by 1.5 by 2.5 feet	2,737.47
Warren's ranch, 2.57 miles northeast of; on west side of road; point within chiseled circle on top of embedded black granite bowlder 1 by 2 feet, surrounded by stones	2,722.12
Junction with little used road to right	2,698.00
Little Morongo Canyon, in forks of road at junction, where it branches from road to Virginia Dale, about 100 feet southwest from corner common to secs. 11, 12, 13, and 14, T. 1 S., R. 4 E.; iron post, marked "2745 S. B."	2,745.074
Corner common to secs. 11, 12, 13, and 14, T. 1 S., R. 4 E; ground	2,789.00
Little Morongo Canyon; junction of roads at mouth	2,906.00
Little Morongo Canyon, ¼ mile north of mouth of; 10 feet west of road on bench above bed of canyon; point within chiseled circle on top of embedded granite bowlder 1 by 2 feet	2,987.67
Little Morongo Canyon, northeast side of; at "First Water;" bench cut in butt of leaning cottonwood tree 2.5 feet in diameter	3,282.78
Little Morongo Canyon; mouth of lateral canyon, at junction with trail to The Pipes, at upper end of timber patch, 3 feet above ground in face of granite cliff; aluminum tablet, marked "3380 S. B."	3,379.936
The Pipes, trail to; on summit at head of gulch from Little Morongo Canyon, in stump 3 inches in diameter	4,509.05
Summit of spur; at top of shaft on mining claim	4,588.00
The Pipes, 15 feet from summit of trail from Little Morongo to; north side of ridge, in butt of oak tree 4 inches in diameter	4,581.93
Mining claim; top of shaft and mouth of tunnel	4,545.00
Tunnel, mouth of	4,484.00
Sand wash, at foot of trail running down about ¾ mile, when it turns to north and goes over small divide; ground	4,250.00
Chaparrosa Springs, ¼ mile south of; at summit of divide between sand wash and	4,316.00
Chaparrosa Springs, 75 feet north of; point within chiseled circle on top of granite bowlder 9 by 4 by 3.5 feet	4,218.01
The Pipes, 1¾ miles southeast of; 200 feet north of head of trail from big sand wash; point within chiseled circle on top of embedded granite bowlder 1.5 by 1 foot, surrounded by stones	4,162.10
Sand wash, at trail crossing	4,110.00
The Pipes, ½ mile southeast of; at northeast corner of reservoir in northwest corner of field	4,376.00

	Feet.
The Pipes, 20 feet northeast of house, 45 feet southwest of barn, 2 feet east of yucca tree, surface of ground; iron post, marked "4459 S.B."	4, 458. 83
The Pipes, at northeast corner of barn; on rock	4, 457. 85
The Pipes, near, in bed of wash at crossing; road........................	4, 401. 00
The Pipes, ¼ mile north of house, at junction of roads to Warrens Wells and to the Rose mine; ground..	4, 405. 00
The Pipes, 1.5 miles northwest of; at right of road, on southwest side of wide sand wash; bench cut in butt of willow tree 4 inches in diameter.	4, 426. 07
Burns Canyon, road into; at summit of divide where road crosses to enter wash from canyon, southwest side of wash	4, 602. 00
Burns Spring, 1 mile southeast of; 10 feet south of road in mouth of canyon, at junction of road from Rose mine to Warrens Wells and Virginia Dale with road to the Pipes; in butt of willow tree 8 inches in diameter...	4, 709. 84
Burns Spring, 45 feet west of; in bottom of wash; point within chiseled circle on top of embedded granite bowlder 3 by 4 feet................	4, 949. 02
Burns Canyon, at foot of steep grade where road leaves canyon to climb hill toward Antelope Creek	5, 190. 00
Burns Spring, 1¼ miles northwest of; at foot of tree at right of road; ground	5, 455. 00
Burns Spring, 1¾ miles northwest of; in saddle of ridge; at top of first steep hill out of canyon surface of ground; iron post, marked "5438 S. B."...	5, 437. 670
Antelope Creek; bed of wash at road crossing	5, 476. 00
Antelope Creek, 140 feet north of; at west of road; point within chiseled circle on top of granite bowlder 6 by 4 by 2.5 feet.....................	5, 500. 27
Rattlesnake Canyon, about 1.1 miles southeast of; where road enters it at junction of road from The Pipes to Rose mine with road to Old Womans Springs, 23 feet west of pinon tree; iron post, marked "5736 S. B."...	5, 735. 844
Antelope Valley, road junction at top of first steep hill out of; at foot of tree; ground	5, 732. 5
Rattlesnake Canyon, summit of divide where road begins descent into ...	5, 991. 5
Rattlesnake Canyon, where road first comes into wash..................	5, 894. 5
Rose mine, 2¾ miles southeast of; at foot of hill where road branches, one branch running southeast over hill and the other running east down canyon	5, 997. 00
Rose mine, 2¼ miles southeast of, 20 feet north of road at summit of spur; nail in pinon tree 8 inches in diameter..............................	6, 231. 29

WHITEWATER SIDING, VIA WHITEWATER CANYON, TO TOWNSHIP 1 SOUTH, RANGE 2 EAST.

Whitewater, 2⅞ miles north of, at right of road; point within chiseled circle on top of embedded granite bowlder 16 by 8 inches, surrounded by stones	1, 618. 33
Whitewater, 4¼ miles north of; corner common to secs. 26, 27, 34, and 35, T. 2 S., R. 3 E., on small flat about 30 feet east of foot of hill, west side of Whitewater River, where road crosses the second time; point within chiseled circle on top of granite bowlder 6 by 8 by 8 inches............	1, 832. 76
Whitewater, 4⅞ miles north of; at rock point on west side of canyon; nail in butt of black willow tree 6 inches in diameter	1, 916. 16
Whitewater, 5¾ miles north of; at right of road near rock point on west side of canyon, opposite south end of stratified bluff of cement gravel; nail in butt of forked black willow tree	2, 088. 58

	Feet.
Whitewater, 6.6 miles north of; about 50 feet west of road, 50 feet east of Whitewater Channel, near north end of cement gravel bluff; point within chiseled circle on top of embedded granite bowlder 12 by 8 inches	2,241.58
Whitewater, 8 miles north of; on west side of canyon; point within chiseled circle on top of granite bowlder surrounded by stones	2,530.88
Whitewater Canyon, west side of; near red point of ridge from west and large red bowlder in wash known as Red Dome, at right of road, opposite where trail from Mission Creek enters canyon; nail in butt of black willow tree	2,581.01
Red Dome, about 1¼ miles northwest of; 100 feet north of creek crossing, on right side of road; point within chiseled circle on top of embedded granite bowlder, 2 by 3 feet surface	2,855.05
Whitewater Canyon, on rock point on north side of; opposite grove of alder and cottonwood trees on south side of canyon; bench cut in butt of cottonwood tree 2 feet in diameter	3,083.80
Whitewater Creek, 475 feet southwest of junction with creek from the south; southwest side of Whitewater Canyon, 500 feet south of cluster of pine trees, in vertical face of granite ledge, 1.5 feet above ground; aluminum tablet, marked "3438 S. B."	3,438.008

DRY MORONGO TO CORNER OF TOWNSHIPS 1 AND 2 SOUTH, RANGES 3 AND 4 EAST.

Dry Morongo, bed of; 770 feet below forks of canyon, where trail from Chuck Warren's to Hog ranch, on Willow Creek, crosses	2,504.00
Dry Morongo, forks of	2,540.00
Dry Morongo, in mouth of left-hand fork at forks of left fork of; bench cut in butt of black willow 5 inches in diameter	2,652.12
Dry Morongo, top of bluff in mouth of right fork of left fork	2,694.00
Corner common to Ts. 1 and 2 S., Rs. 3 and 4 E., which is also a corner of the San Bernardino Forest Reserve and is marked "No. 99," in top of cement-filled iron post 4 inches square; aluminum tablet, marked "3075 S. B."	3,074.919

FOOT OF TRAIL TO THE PIPES VIA LITTLE MORONGO CANYON TO TOWNSHIP 1 NORTH, RANGE 3 EAST.

The Pipes, 0.6 mile northwest of trail to; in Little Morongo Wash, opposite mouth of canyon from east, in which is a mining tunnel; point within chiseled circle on top granite bowlder 2.5 by 2.5 by 5 feet	3,544.80
Little Morongo, at junction with North Fork; in butt of willow tree 4 inches in diameter	3,830.09
Little Morongo, at junction with large wash from left	4,046.00
Little Morongo, 50 feet northwest from junction with wash from left, on south side of canyon; point within chiseled circle on top of granite bowlder 8 by 8 by 5 feet	4,060.12
Little Morongo, on west side of canyon, where it makes sharp turn from north to the west, beside willow tree 1 foot in diameter; chiseled circle on top of granite bowlder 5 by 3 by 2 feet	4,391.82
Little Morongo, on south side of canyon at camping place at second water, in red granite ledge 10 feet above creek bed; aluminum tablet, marked "4831 S. B."	4,830.926

San Antonio Quadrangle.

The elevations in the following list are a continuation of those determined in connection with the Hesperia and Deep Creek quadrangles, and previously published.

They are based on the bronze tablet in the court-house at San Bernardino, the elevation of which is 1,047.758 feet.

The leveling was done under the direction of Mr. W. T. Turner, topographer, by Mr. C. R. Smith, levelman.

KEEN BROOK, VIA NORTH FORK OF LYTLE CREEK AND SHEEP CREEK ROAD, TO TAMBORINO RANCH, 10 MILES WEST OF HESPERIA.

	Feet.
Keen Brook, in front of Southern California Railway section house; on top of clearance post	2,477.45
Keen Brook, 1.65 miles northwest of; in summit of gap between Keen Brook and Lytle Creek canyons, south side of road; + on embedded stone	3,459.69
Glen ranch, 40 feet west of westernmost building; iron post, marked "3256 S. B."	3,256.44
Glen ranch, 0.6 mile northwest of, where old wagon road (passable now only on horseback because of washouts) branches to north toward Lone Pine Canyon; surface of ground	3,400.00
Glen ranch, 5.45 miles northwest of; at mouth of Coldwater Canyon, near first pine tree above forks of road; iron post, stamped "5017 S. B."	5,017.266
Glen ranch, 7.25 miles northwest of; on northwest side of dry wash of north fork of Lytle Creek, at the foot of an old skid road which here starts up mountain to northward, past old camping ground known as the Oaks; nail in foot of big pine tree	5,927.16
Glen ranch, 8.45 miles northwest of; at head of old skid road in gap of mountain spur between north fork of Lytle Creek on the south and Lone Pine Canyon on the north, 20 feet west of path; + on point of outcropping granite ledge	6,618.09
Hesperia, 25.35 miles southwest from; in gap between Sheep Creek and Lone Pine Canyons, south side of road; + on square-tipped embedded bowlder	6,067.13
Hesperia, 24.65 miles southwest from; north side of road at the forks where Swertout road branches off to the west; iron post, marked "6006 S. B."	6,005.928
Hesperia, 21.85 miles southwest from; at forks where road to Oak Springs branches off to the west; ground	5,056.00
Hesperia, 19.35 miles southwest from; where main traveled road branches off to northwest to Palmdale and Lancaster, west side of road forks; iron post, marked "4429 S. B."	4,428.822
Hesperia, 17.65 miles southwest from; at road forks of old abandoned ranch, where road from Sheep Creek to Victor branches off to the northeast, 50 feet north of road; on nail head in center of top edge of curbing plank on west side of old well	4,162.71
Hesperia, 11.15 miles southwest from; in front of house of R. L. Cook, on south side of road; on nail in lone yucca tree	3,858.02
Hesperia, 10 miles west of; south side of road at the Tamborino ranch; iron post, marked "3740 S. B."	3,739.627

SIERRA, MADERA, FRESNO, MARIPOSA, AND MONO COUNTIES.

MOUNT LYELL QUADRANGLE.

The elevations in the list below are based primarily upon mean sea level at Oakland, but depend directly upon vertical angles in connection with the spirit leveling done on the Mount Lyell quadrangle, to which reference has previously been made.

The elevations were established by Mr. R. B. Marshall, topographer, in connection with the topographic work.

	Feet.
Cloud Rest Peak, summit of; in flat rock 35 feet north of small monument; aluminum plug, stamped "U.S.G.S. V.A. B.M.O."	9,925.00
Mount Conness triangulation station; in top of concrete pier; aluminum plug, stamped "U.S.G.S. V.A. B.M.O."	12,556.00
Lyell Fork of Merced River, 1 mile west of where trail crosses and 200 yards east of trail; on yellow top point of rocky dome; aluminum plug, stamped "U.S.G.S. V.A. B.M.O."	9,520.00
Merced Pass; west of old corral gate, in flat white granite bowlder 2 feet high; aluminum plug, stamped "U.S.G.S. V.A. B.M.O."	9,295.00
Fernandez Pass; on bench of white granite bowlder south of and near trail where it descends rapidly toward the east; aluminum plug, stamped "U.S.G.S. V.A. B.M.O."	10,175.00
Isberg Pass; on volcanic rock 6 feet high, 10 feet north of where trail turns south while going in a northerly direction; aluminum plug, stamped "U.S.G.S. V.A. B.M.O."	10,502.00
"77 Corral;" in lone white granite bowlder 2 feet high in center of meadow, 50 yards across creek from trail going east; aluminum plug, stamped "U.S.G.S. V.A. B.M.O."	7,955.00
Junction of Fish Creek and San Joaquin River, ridge between; blue top dome one-fourth mile west of trail going south; aluminum plug, stamped "U.S.G.S. V.A. B.M.O."	7,125.00
Agnew Pass, 100 yards due west of where trail going north passes first lake, on highest point of ridge; aluminum plug, stamped "U.S.G.S. V.A. B.M.O."	9,946.00
Island Pass, one-third mile west of, on flat pot-hole bowlder at summit of dome-shaped point 250 feet above pass; aluminum plug, stamped "U.S.G.S. V.A. B.M.O."	10,473.00
Chiquito Pass, 3 feet south of trail on top of yellowish bowlder on last moraine going north; aluminum plug, stamped "U.S.G.S. V.A. B.M.O."	8,039.00

ORANGE, RIVERSIDE, SAN BERNARDINO, AND SAN DIEGO COUNTIES.

CORONA QUADRANGLE.

The elevations in the list below are based primarily upon a bronze tablet on northeast corner of court-house in San Bernardino, but started directly from a bench mark established in 1897 on an iron post on Magnolia avenue, 4 miles east of Corona, the elevation of which was found to be 687.018.

The leveling was done by Messrs. P. R. Smith and C. C. Ward, levelmen.

MAGNOLIA AVENUE, VIA CORONA, TO RINCON.

	Feet.
Corona, 2 miles east of, where wagon road first crosses cemented irrigating ditch; on head of nail in 4 by 4 inch cap at north end of culvert	644.96
Corona, Santa Fe Railroad station; on head of nail in northwest corner of 6 by 6 inch wooden curb to park plat	602.10
Corona, at southwest corner of Boulevard and Sixth street; on nail in telephone pole, about 4 feet from ground	675.85
Corona, at crossing of Sixth street and Lincoln avenue; on nail head in north end of culvert of storm-water ditch	687.12
Corona, at northeast corner of Lincoln avenue and Olive street; on top of brick penstock	755.39
Corona, at east side of Buena Vista avenue, where it is crossed by Ontario avenue; on nail in south end of planking of road culvert	876.55
Corona, at northwest corner of Buena Vista avenue and Limon street (pipe line No. 2); iron post, marked "1049 S. B."	1,049.491
Corona, at southeast corner of Limonia grove; on 4 by 4 inch street-corner monument	1,052.06
Corona, 1 mile west of; on south side of telephone road at summit; on nail in foot of blazed telephone pole	698.75
Rincon, on north side of street, at southeast corner of post-office and store; iron post, marked "494 S. B."	493.702

RINCON TO CHINO.

Rincon, 3 miles west of; where Chino road crosses railroad track; on tack in crossing post, about 8 feet above ground	487.57
Rincon, 2.5 miles northwest of; on east side of road at West's place; on nail in big blue gum tree, about 6 feet above ground	510.31
Pioneer schoolhouse, on nail head in south end of bottom step of porch	500.88
Chino rancho, south boundary of; at southeast corner of road crossing north from Pioneer schoolhouse past the place of Frank Slaughter; on wooden plug at foot of fence post	558.60
Chino rancho, at crossing of diagonal road over small slough about 1¼ miles northwest of; where road leaves south boundary of the Rancho; on nail in top of post at east side of bridge over slough	559.38
Chino rancho, where diagonal road crosses east branch of Chino Creek; on nail on east end of mud plank at north end of small queen-post of truss bridge	587.06
Chino rancho, where Central avenue crosses road running east and west; in northwest angle of 1.5 miles south of Southern Pacific station at Chino; iron post, marked "633 S. B."	632.681
Chino, at crossing of Central avenue and Southern Pacific Railroad track; nail in foot of white crossing signpost, about 1 foot above track	724.97

CHINO TO CORONA.

Chino rancho, at southeast corner of boundary; iron post, marked "602 S.B"	602.469
Pomona and Elsinore Railroad grade, where crossed by Archibald avenue, on west side of avenue; on nail in south gatepost, about 4.5 feet above ground	589.45
Fuller district school, at northwest corner of inclosure; on nail in corner post of fence, about 3 feet above ground	587.12
Santa Ana River, 1,000 feet northwest of Younts Ford, at south end of graded lane and west side of road; on nail in top of east post of irrigating flume	569.74

	Feet.
Santa Ana River, surface of low water at Younts Ford	560
La Sierra rancho (Sepulveda), 1 mile south of Cooks Ford, east side of road from Corona; iron post, marked "683 S.B."	683.283
Corona, 3.1 miles northeast of; 20 feet east of road to Cooks Ford; cross (+) on large embedded granite bowlder	678.31
Corona, 1¼ miles northeast of; where high line ditch passes over gulch on high earthen embankment; on nail in west end of planking of bridge over cement ditch	632.62

RINCON TO OLIVE.

Rincon, 2 miles west of; on nail in west end of north-hand rail of bridge over drainage gulley	507.01
Rincon, 3.2 miles west of, where road comes back close to south bank of river; on nail in notch on horizontal limb of big three-pronged cottonwood tree	415.04
Rincon, 4.1 miles west of, where road again leaves south bank of river, on upper side of road; on nail in foot of oak tree	429.53
Rincon, 4.8 west of; on nail in top of 10 by 10 inch corner post of land-grant boundary	388.05
Rincon, 7.3 miles west of, at head of grade where road finally leaves the sidehill slopes of Santa Ana Canyon, on north side of road; iron post, marked "402 S.B."	401.706
Santa Ana Valley Irrigation Canal, where road first crosses; on nail in floor of bridge on north or upper side, at foot of center post of railing	325.33
Peralta, on center of south end of top of parapet of cemented arch drainage culvert No. 11	321.87
Peralta, 1.5 miles southwest of, where branch road goes north across Santa Ana River; on nail in floor at southwest corner of bridge over Santa Ana Valley Irrigation Canal	314.77
Olive; on nail in 7 by 16 inch mudsill under the southwest post of the water tank of the Southern California Railway	222.72

OLIVE, VIA SANTIAGO AND ALISO CANYONS, TO ELTORO.

Olive, 1 mile southeast of, where Silverado road crosses Santa Ana Valley irrigation canal; on nail head in floor at northwest corner of bridge over canal	300.35
Olive, 5.5 miles southeast of, where Silverado road crosses small summit before dropping down to Santiago Creek bottom lands, right side of road; cross (+) on embedded rock, surrounded by ring of stones	564.79
Olive, 7.7 miles southeast of; at northeast corner of fence of Orange County Park, 20 feet right of road; iron post, marked "610 S. B."	610.041
Olive, 9.4 miles southeast of; on east side of road; on head of nail in root of big sycamore tree	701.42
Olive, 12 miles southeast of; where road to Black Star mine branches off to east up side gulch, 50 feet southeast of forks of road; on nail in crotch of small sycamore tree	855.68
Olive, 13.7 miles southeast of; where road to Silverado turns off to east up side gulch, 8 feet right of main road; iron post, marked "977 S. B."	977.326
Olive, 15.7 miles southeast of; at residence of Mr. P. E. Pleasants, under front fence; + on embedded rock	1,142.94
Olive, 17 miles southeast of; where Santiago road begins to climb side hill to cross divide into Aliso Canyon; at forks of road; + on embedded rock surrounded by stones	1,265.35

	Feet.
Olive, 17 miles southeast of; where Santiago Canyon road begins to climb side hill to cross divide into Aliso Canyon, en route to Eltoro; iron post, marked "1271 S. B."	1,270.553

RINCON, VIA OLIVE, SANTIAGO CANYON, AND ALISO CANYON, TO ELTORO.

	Feet.
Aliso schoolhouse, 2 miles northeast of; on east side of wagon road on summit of divide between Santiago and Aliso canyons; in top of wooden hub at fence corner	1,648.03
Aliso schoolhouse, ½ mile north of; about 12 feet east of road, 50 feet south of gate across road, and about 1,000 feet north of the junction of roads at the forks of Aliso Creek; nail in butt of prostrate sycamore tree 2 feet diameter	1,116.46
Aliso schoolhouse, ⅓ mile north of; floor of bridge over east fork of Aliso Creek	1,090.00
Aliso schoolhouse, about ¼ mile north of; floor of bridge over Aliso Creek	1,067.00
Aliso schoolhouse, 30 feet north of; in yard; nail in butt of triple sycamore tree	1,038.42
Aliso schoolhouse, about 45 feet from; in northwest corner of yard; iron post, marked "1041 S.B"	1,040.878
Aliso schoolhouse, about 1⅓ miles southwest of; 20 feet east of road; nail in butt of sycamore tree 4 feet diameter	857.19
Aliso schoolhouse, 2⅞ miles southwest of; east side of road at junction with road to Santa Ana; nail in butt of sycamore stump	695.41
Eltoro, 2 miles northeast of; 15 feet south of west end of bridge over Aliso Creek, adjoining sycamore tree that is used as a gatepost; nail in butt of sycamore tree 3 feet diameter	619.46
Eltoro, 1¼ miles northeast of; on east side of road at junction with road to south; nail in wooden peg at fence-corner post	558.91
Eltoro, about ¾ mile northeast of; on west side of road at junction with road to Santa Ana and also with road to east; nail in wooden peg at fence-corner post	504.86
Eltoro schoolhouse; on wooden peg at north corner of fence	444.69
Eltoro schoolhouse, about 2 feet from front of; in angle formed by porch and building; iron post, marked "444 S. B."	443.919

ELTORO, VIA SOUTHERN CALIFORNIA RAILWAY, TO LAS FLORES.

	Feet.
Eltoro, 1¼ miles southeast of; head of bolt in north end of west guard rail on trestle No. 47	428.54
Eltoro, about 2⅓ miles south of; 50 feet west of track, opposite gate on east side of track; head of spike at surface of ground in south post of gate	359.68
Eltoro, 2⅔ miles south of; head of bolt in north end of west guard rail on trestle No. 50	346.48
Eltoro, 3⅞ miles south of; about 50 feet west of track at 192-mile post; head of railroad spike in base of telegraph pole, marked "192"	295.55
Eltoro, 4⅓ miles south of; nail in top of short post at east side of south end of north cattle guard at railroad crossing	279.48
Eltoro, 4⅓ miles south of; about 40 feet east of track at road crossing in fence corner; iron post, marked "278 S. B."	278.177
Capistrano, 4⅙ miles north of; nail in east end of north cap of trestle No. 52	255.52

	Feet.
Capistrano, about 3 miles north of; 65 feet east of track, on east side of wagon road, in front of ranch house; nail in butt of northernmost eucalyptus tree, 18 inches diameter, in row of shade trees	220.44
Capistrano, about 2 miles north of; ½ mile north of trestle over Trabuco Creek, 15 feet west of track, opposite double-butt sycamore tree 20 feet east of track; nail in butt of sycamore tree	205.59
Canada Trabuco; nail in east end of south cap of trestle No. 55	174.39
Capistrano; south of station; first post south of northwest corner of flower plot, midway between two brick posts; nail in top of wooden fence post.	105.21
Capistrano; in northwest corner of flower plot south of station and east of track; iron post, marked "103 S. B."	103.074
San Juan Creek; nail in east end of south cap of trestle No. 57	70.85
San Juan, ¾ mile northeast of; about 40 feet west of track, near fence line, 40 feet northeast of post between railroad sections 31 and 32; railroad spike in base of telegraph pole	48.57
San Juan; west side of track, opposite water tank; lag bolt in circular base of iron water standpipe	17.78
San Juan, 1⅛ miles south of; 45 feet west of track, opposite milepost 201; railroad spike in base of telegraph pole	10.95
San Juan, 2⅛ miles southeast of; nail in top of milepost 202	15.16
Trestle No. 61, nail in east end of sixth cap from north end of	11.01
Trestle No. 63, nail in west end of north cap of	12.42
San Mateo Creek, 3 miles northwest of; nail in east side of south cap of trestle No. 69	13.86
Trestle No. 77, nail in west end of north cap of	13.23
San Mateo Creek, 0.6 mile northwest of; nail in top of milepost 207	16.03
San Mateo Creek, ⅛ mile south of; nail in west timber of south cattle guard at road crossing	10.39
San Onofre Creek, center of trestle over	24.2
San Onofre siding, nail in top of clearing stake at northwest end of	28.26
San Onofre siding; 20 feet front of section bunk house, in yard; iron post, marked "28 S. B."	27.972
San Onofre, 1½ miles southeast of; nail in west end of north cap of trestle No. 95	95.00
San Onofre, 1¾ miles southeast of; top of rail of trestle No, 96	121.00
San Onofre, 2½ miles southeast of; nail in west end of south cap of trestle No. 97	148.54
Trestle No. 98; top of rail	149.8
Trestle No. 99; top of rail	164.6
Trestle No. 100, nail in east end of south cap of	160.36
Jerome siding, 2.4 miles northwest of; nail in center stringer on west side of south cattle guard at road crossing	161.3
Jerome, 2.4 miles northwest of; 50 feet east of track, in fence corner on south side of cattle crossing; iron post, marked "165 S. B."	165.017
Jerome, 1⅛ miles northwest of; nail in west end of north cap of trestle No. 103	151.27
Jerome, ⅛ mile northwest of; nail in center stringer on west side of cattle guard	137.48
Jerome, ⅞ mile southeast of; 60 feet south of road crossing; nail in top of milepost 217	88.18
Las Flores; 10 feet southwest of water tank, east side of track; iron post, marked "84 S. B."	84.037

ESPERANZA SIDING, VIA WAGON ROAD, TO SAN JUAN TRIANGULATION STATION.

	Feet.
Santa Ana River; surface of water at ford	316.00
Santa Ana River, wasteway over lower ditch on north side of	331.00
Esperanza siding, at east end of; nail 2 feet from north end of timber foundation for switch stand	340.19
Santa Ana River, bridge over upper canal on north side of	381.00
Esperanza siding, 1⅛ miles north of; left side of road, at forks of canyon; nail in butt of elder tree 14 inches diameter	494.08
Esperanza siding, 2 miles northeast of; near forks of canyon and near foot of steep grade; nail in butt of lone sycamore tree 2 feet diameter	632.94
San Juan triangulation station; in top of stone and cement monument; aluminum tablet, marked "1780 S. B."	1,780.194

SAN JUAN CREEK TO LINE BETWEEN TOWNSHIPS 7 AND 8 SOUTH, RANGE 7 WEST.

Capistrano, about 2 miles east of; north side of road, about 320 feet east of the corner common to secs. 31 and 32, T. 7 S., R. 7 W., and secs. 5 and 6, T. 8 S., R. 7 W.; iron post, marked "149 S.B."	149.053

The following elevations were determined by vertical angles:

	Feet.
Santiago Peak, summit of; in cement block of United States Coast and Geodetic Survey monument; aluminum plug, stamped "U.S.G.S. V.A. B.M."	5,680.00
San Juan Canyon, 13 miles from Capistrano, in bowlder in Henry Siever's barnyard; aluminum plug, stamped "U.S.G.S. V.A. B.M."	700.00
San Juan Canyon, 4.5 miles west of Capistrano, in bowlder at forks of road near the ruins of Mission Viego; aluminum plug, stamped "U.S.G.S. V.A. B.M."	205.00
San Juan and San Mateo canyons, on hill directly east of divide between, about 6 miles east of Capistrano, in rock; aluminum plug, stamped "U.S.G.S. V.A. B.M."	670.00

SAN MATEO, SANTA CLARA, AND SANTA CRUZ COUNTIES.

PESCADERO QUADRANGLE.

The elevations in the following list are based on a bench mark established by the United States Coast and Geodetic Survey at Redwood. This bench mark is on top of a fire hydrant at northeast corner Sixth and Arguello streets, opposite Southern Pacific Company's station. Its elevation was given as 15.412 feet above mean of lower low water at Foot Point, or 12.312 feet above mean sea level.

The leveling was done by Mr. C. C. Ward, levelman, at first under the direction of Mr. E. C. Barnard, topographer, and later under the direction of Mr. A. B. Searle, topographer.

REDWOOD, VIA COUNTY ROAD, TO SAN JOSE.

	Feet.
Redwood top of fire hydrant at northeast corner of Sixth and Arguello streets, opposite Southern Pacific Company's station	12.31
Redwood, 1.6 miles south of station, on east side of road near southeast corner of road crossing; nail in foundation of water tank	31.62

	Feet.
Menlo Park, 1 mile north of, at right of road; nail in butt of oak tree 2½ feet in diameter	52.46
Menlo Park, at northeast corner of Grave avenue and San Francisco road; base of hinge on top of fire hydrant	72.13
Palo Alto, at northeast corner of station, on iron rail surrounding walk, which rail is set in brick and cement. This bench mark was established by the United States Coast and Geodetic Survey and the elevation given as 63.327	63.36
Mayfield, at Mayfield Hotel, near the north corner of the intersection of county road and Lincoln street, in top of iron hitching post at edge of sidewalk, this post being the first one northwest from corner on county road	42.11
Mayfield, ¾ mile southeast of; 40 feet northwest of bridge over Matadero Creek, 45 feet southeast of water tank; in butt of oak tree at right of road	39.52
Yeguas Creek, on northeast side of bridge; head of large bolt in northwest end of truss	63.99
Castro, 50 feet southeast of junction with road to; in butt of oak tree 3 feet in diameter on southwest side of road	82.57
Springer Road, junction with; nail in southeast corner of foundation of windmill tower at west side of road	96.45
Mountain View (old town), opposite hotel at junction of San Francisco and San Jose road with Grant road; in butt of oak tree 2 feet in diameter	124.42
Mountain View, 0.9 mile southeast of; nail in northwest side of foundation of water tank at side of center of post	141.60
Hollenbeck avenue; nail in northwest corner of foundation of water tank	130.18
Milliken avenue; spike in center of west side of foundation of water tank and windmill	96.11
Boyter road, near northeast corner of junction with San Francisco and San Jose road; nail on box surrounding cut-off cock to water pipe. Road here turns right angles to the east	130.74
Alviso-Saratoga road, southwest corner of; nail on top of most southerly post of bulkhead	100.61
Pacific Seed Company, at junction with road to gardens; nail in east end of sill at north end of bridge over dry water course	84.26
Campbell Creek, bridge over	85.00
Scott lane, at northwest corner of intersection; in butt on eucalyptus tree 2 feet in diameter	88.39
Santa Clara, at intersection of Franklin avenue and Monroe street; top of fire hydrant at northeast corner of	94.31
Santa Clara, intersection of Franklin avenue with Alviso street; top of fire hydrant at north corner of	90.12
The Alamedo, intersection with University avenue; nail in end of drain box at southeast corner of	88.28
San Jose; at north corner of intersection of Spring and Hobson streets; nail in top of block corner post	80.65

SAN JOSE VIÀ NARROWGAGE RAILROAD TO LOS GATOS.

San Jose, 150 feet east of Southern Pacific Company's broad-gage station; log bolt in circular base of iron water stand about 2 feet in diameter	91.76

NOTE.—This is a bench mark of the United States Coast and Geodetic Survey, the elevation of which was given as 90.555 feet. This differs from Mr. Ward's levels as brought from Redwood, which are in a closed circuit. The United States Coast and Geodetic Survey levels were not checked at San Jose.

	Feet.
San Jose, at southwest corner of St. James and First streets, opposite St. James square; set horizontally in west end of lower edge of stone banister on north side of entrance to Santa Clara County Hall of Records; aluminum tablet, marked "98 S.F."	98.317
San Jose, at northwest corner of Dupont and San Carlos streets; wire nail in root of pine tree 14 inches in diameter	105.77
San Jose, 2.9 miles southwest of; wire nail in top of railroad milepost 48.	144.51
Campbell, 1 mile northeast of; wire nail in top of railroad milepost 49	173.56
Railroad milepost 51, wire nail in top of	220.58
Railroad milepost 52, wire nail in top of	254.52
Los Gatos, northeast end of station platform on southwest side of Main street, between Santa Cruz avenue and Oak street; top of fire hydrant.	411.00
Los Gatos, opposite station, in west corner of yard around Hotel Lindon on Santa Cruz avenue; iron post, marked "412 S.F."	412.012

LOS GATOS, VIA RAILROAD AND WAGON ROAD, TO BOULDER CREEK.

Los Gatos, ¾ mile southwest of; wire nail in top of railroad milepost 56	427.66
Railroad milepost 57; wire nail in top of	516.65
Lexington, at junction of "Bear Creek" road with Los Gatos-Alma wagon road; wire nail in top of oak stump 18 inches in diameter	560.03
Lexington, 1 mile southwest of; wire nail on top of west end of south rail of bridge over small creek	908.79
Montezuma schoolhouse, ⅛ mile north of; wire nail in butt of madroña tree 2 feet in diameter at right of road	1,327.59
Montezuma schoolhouse, 35 feet south of, near fence; wire nail in butt of triple madroña tree	1,458.23
Montezuma schoolhouse, 45 feet north of, in corner of yard; iron post, marked "1459 S.F."	1,459.074
Brown schoolhouse, ⅛ mile east of, at left of road; wire nail in butt of live-oak tree 10 inches in diameter	2,090.00
Brown schoolhouse, 25 feet south of; wire nail in butt of dead oak tree 18 inches in diameter	2,137.51
Brown schoolhouse, about 30 feet south of; at the 1/16 section corner at center of NE. ¼ corner of sec. 12, T. 9 S., R. 2 W.; iron post, marked "2135 S.F."	2,135.031
Brown schoolhouse, 1.09 miles west of, at right of road; wire nail in butt of oak tree 2 feet in diameter	2,109.63
Brown schoolhouse, 1¾ miles west of, at left of road; wire nail in butt of oak tree 2 feet in diameter	2,001.18
Hoffman's private road, 50 feet west of its junction with Bear Creek road near Tabacco's ranch, at left of road; wire nail in butt of black-oak tree 20 inches diameter	1,861.99
Hoffman's house, below; at junction of private road with Bear Creek road.	1,190.00
Hoffman's private road, ⅛ mile below its junction with Bear Creek road, at right of road; wire nail in butt of leaning madrone tree 16 inches diameter	1,153.09
Bear Creek schoolhouse, ⅛ mile east of, at north side of road, 350 feet east of bridge over Bear Creek; wire nail in butt of redwood stump 4.5 feet diameter	750.18
Bear Creek schoolhouse, at west corner of yard; wire nail in butt of live-oak tree 20 inches diameter	764.16
Bear Creek schoolhouse, 10 feet north of northwest corner of; iron post, marked "735 S. F"	735.042

	Feet.
Harmon's sawmill near northwest corner of; about 30 feet east of bridge over small creek on left of road, about 2 feet from water hydrant; in madrone tree about 2 feet in diameter	581.78
Harmon's mill, about ¾ miles southwest of, at right of road; wire nail in root of oak tree 3 feet in diameter	572.27
Boulder Creek, about 1 mile northeast of, about 120 feet south of bridge over small creek at left of road; top of redwood stump 5 feet in diameter.	544.26
Boulder Creek, at southeast corner of "Boulder Creek House" yard, west side of road; a wire nail in butt of live-oak tree 2 feet in diameter	482.31
Boulder Creek, at east side of fountain in "Boulder Creek House" yard; iron post, marked "484 S. F"	484.009
Boulder Creek, on east side of Oak street at junction with Boulder Creek road; top of fire hydrant	501.85

BOULDER CREEK, VIA WAGON ROAD AND TRAIL, TO LA HONDA.

	Feet.
Boulder Creek, 1 mile northwest of, about 400 feet north of bridge and tank, at right of road; wire nail in fir stump 3 feet in diameter	562.83
Boulder Creek, 2.1 miles northwest of, about 20 feet northwest of water trough at right of road, about 75 feet northwest from junction with old road to west, 300 feet southeast of bridge; wire nail in butt of fir stump.	709.57
Duffy's mill, at left of road at office; on double butt live-oak tree	802.37
Sequoia schoolhouse, ¾ mile southeast of, at junction with road to west and at right of road; nail in butt of madroña tree 10 inches in diameter	853.34
"Jim Day Creek," 120 feet south of bridge, at right of road; wire nail in root of redwood stump	887.98
Sequoia schoolhouse, at northwest corner of fence around, on right of road; nail in butt of redwood stump, 3 feet in diameter	912.29
Sequoia schoolhouse, in yard at south side of stile; iron post, marked "916 S. F"	916.025
Sequoia schoolhouse, about ¾ mile north of; nail in west end of cap at north end of bridge over gulch opposite old mill site	1,006.29
Sequoia schoolhouse, 1 mile north of, foot of steep grade, on right side of road at east end of bridge over Boulder Creek; nail in root of fir stump	1,003.58
Township line between Ts. 8 and 9 S., 10 feet north of cor. to secs. 33 and 34, T. 8 S., and secs. 3 and 4, T. 9 S., R. 3 W., at right of road; nail in butt of tan-bark oak tree 1 foot in diameter	1,378.49
Sequoia schoolhouse, 2 miles north of, on point of ridge, at right of road; nail in top of redwood stump 5 inches diameter	1,746.81
Tray's ranch, at left of road at bend, at end of trail above house, near vineyard; nail on top of redwood stump 5 feet high, 6 feet diameter	2,142.97
Butano Ridge, about ½ mile north of Tray's house, at end of graded wagon road; nail in butt of live-oak tree 18 inches diameter	2,320.43
Butano Ridge, at end of wagon road; iron post, marked "2319 S. F"	2,318.980
Rock camp, about 1 mile north of, on top of Butano Ridge, at side of old pack trail; wire nail in butt of tan-bark oak tree	2,212.37
Summit of very steep, brushy trail, which here leaves Butano Ridge and runs to east down steep spur toward Pescadero Creek	2,222.00
Iverson's ranch, on Pescadero trail, 1¾ miles west of, at left of pack trail; nail in butt of oak tree 3 feet in diameter	2,131.49
Spring, 50 feet south of, at right of trail; nail in butt of oak tree 2.5 feet diameter, which has been burned flat on one side	1,553.28

	Feet.
Iverson's ranch, at junction of Pescadero Creek-Boulder Creek trail with wagon road to La Honda, at west side of road; nail in butt of madrone tree 3 feet diameter	424. 42
Iverson's ranch, at junction of Boulder Creek and Pescadero Creek trail with road to La Honda, west side of road; iron post, marked "422 S. F"	421. 999
Page's mill, 135 feet north of, junction with road to, at left of road; nail in root of redwood tree	635. 13
Alpine schoolhouse, 1½ miles south of; at wagon-gate entrance to Mrs. Evans's ranch, at left of road; wire nail in butt of eucalyptus tree 3 feet in diameter	1, 211. 36
Alpine schoolhouse, about ¼ mile west of; in triangle between roads at junction of Alpine, Mayfield and Alpine, and La Honda roads with Alpine and Page mill road; iron post, marked "1590 S.F"	1, 590. 009
Alpine schoolhouse, about 1.5 miles west of; at intersection with private road to west, at left of road in point of loop called the "Turntable;" nail in butt of oak tree 2.5 feet in diameter	1, 084. 39
Hansen's shingle mill, 1⅜ miles east of, at right of road; nail in butt of leaning madroña tree 8 inches in diameter c	840. 75
Hansen's shingle mill, 1 mile east of, at left of road, 60 feet west of bridge over San Gregorio Creek; nail in triple butt myrtle tree	616. 46
Hansen's shingle mill, about 200 feet east of and 200 feet north of the cook house, at left of road; wire nail in butt of redwood tree about 5 feet in diameter	504. 46
La Honda, 1.9 miles south of, at junction of La Honda-Alpine road with La Honda-Pescadero road, 25 feet north of bridge over San Gregorio Creek, at left of road; wire nail in top of oak stump 6 inches in diameter.	448. 34
La Honda, 1⅛ miles south of, at junction of La Honda-Alpine and La Honda-San Gregorio roads, in triangle; a nail in butt of burned redwood tree 8 feet in diameter	347. 48
La Honda, 30 feet east of post-office, in road; in butt of redwood stump 6 feet in diameter	400. 40
La Honda, north side of front entrance to hotel at steps; iron post, marked "403 S. F"	403. 021

LA HONDA, VIA WAGON ROAD, TO PALO ALTO.

La Honda, 1 mile north of; bolt in southwest end of right side of truss on bridge over Arroyo Honda	505. 78
Weeks's sawmill, 75 feet south of bridge over Woodruff Creek, 40 feet west of road, 30 feet south of cook house; nail in top of hollow redwood tree.	580. 34
Weeks's sawmill, 0.9 mile north of, at left of road; nail in butt of live-oak tree 3 feet in diameter	858. 49
Weeks's pond, ⅓ mile northeast of, at left of road; nail in butt of hollow oak tree 18 inches in diameter	1, 122. 42
Summit of divide, 1½ miles south of road junction at, at left of road on point where road turns to right; nail in butt of oak stump 10 inches in diameter	1, 387. 42
Summit of divide, ½ mile west of, at left of road on point; nail in top of redwood stump 3 feet in diameter	1, 652. 41
Summit of divide, at junction with road to south, at right of road; nail on top of post in old tramway bulkhead	1, 676. 84
Summit of divide, between Arroyo Honda and Santa Clara Valley, in forks of road at northwest corner of saloon; iron post, marked "1680 S.F"	1, 679. 450
Summit, 0.6 mile north of, opposite saloon at left of road at end of watering trough; nail in root of redwood tree	1, 481. 45

	Feet.
Summit, 1⅜ miles northeast of, ⅛ mile below barn at left of road; nail in butt of four-forked oak tree	1,054.95
Portola, ⅓ mile west of, at junction with road to, about 30 feet from west end of bridge over creek, at foot of steep hill; nail in butt of redwood stump	493.30
Portola, junction with road to; nail in foundation of front side of water tank at side of center post	384.69
Portola, junction with road to; at corner of fence surrounding E. K. Preston's house, on south side of road; iron post, marked "388 S. F."	388.010
Woodside, junction with road to; at right of road, butt of pine tree 16 inches diameter	358.45
Woodside, junction with old road to; 50 feet east of Woodside road, nail in top of oak stump 1.5 feet diameter	297.42
Walsh road, 170 feet north of junction with and east side of; butt of oak tree 2.5 feet diameter, near fence	315.63
Walsh road, 1 mile east of and south side of; nail in butt of oak tree 2.5 feet diameter	276.45
Mayfield and Woodside, 75 feet north of junction with county road to, at west side of Woodside road; on oak tree 4 feet in diameter	150.59
Leland Stanford Junior University, at northeast corner of engineering building; brass nut on top of fire hydrant	98.61
Leland Stanford Junior University, on south side of inner quadrangle, set next to wall on south side of west building, on top of stone ledge on west side of cellar steps; aluminum tablet, marked "89 S. F."	88.577

BOULDER CREEK, VIA WAGON ROAD, TO SANTA CRUZ.

Boulder Creek, 1 mile south of; on west side of road, wire nail in northeast corner of foundation of water tank	456.33
Ben Lomond, about 1.5 miles north of; west side of road, wire nail in butt of redwood stump 10 feet high, 6 feet diameter	447.29
Bridge over small creek from west, floor	438.00
Ben Lomond, 300 feet north of Park Hotel, east side of road; wire nail in foundation of water tank	372.87
Ben Lomond, 40 feet from office of Rowardennen Hotel, on east side of road; wire nail in redwood stump	346.23
Ben Lomond, 10 feet from northwest corner of office of Rowardennen Hotel, in yard; iron post, marked "344 S.F."	344.012
Ben Lomond, about ¼ mile south of, at east side of road; wire nail in butt of oak tree 2.5 feet diameter	323.18
Felton, ½ mile north of, east side of road; wire nail in butt of oak tree 18 inches diameter	301.57
Felton schoolhouse, 15 feet north of northeast corner of; on top of hydrant.	286.48
Felton schoolhouse, midway between two front entrances; iron post, marked "286 S.F."	285.954
Big Trees, 20 feet north of saloon at junction with wagon road to, at west side of road; nail in butt of redwood stump	320.28
Rincon, ¾ mile north of; nail in foundation of water tank	420.57
Rincon siding, west side of wagon road; nail in foundation of water tank.	334.01
Santa Cruz, 1.5 miles north of court-house, at west side of road; wire nail in butt of laurel tree 1 foot diameter	30.17
Santa Cruz, at northeast corner of court-house grounds; base of hinge on top of fire hydrant	17.77
Santa Cruz, in left base of arch at entrance to court-house; aluminum tablet, marked "18 S.F."	18.017

IVERSON'S RANCH, ON PESCADERO CREEK, VIA PIPE-LINE TRAIL, TO TAR CREEK.

	Feet.
Iverson's ranch, $\frac{1}{2}$ mile north of; on west side of road at junction with pipe-line trail; nail in butt of oak tree 18 inches diameter	426.89
Alpine, junction with wagon road to; ground	421.00
Alpine, junction of trail to west with road to; at left of road, where road turns to north uphill; nail in butt of oak tree	422.99
Tar Creek, $\frac{3}{16}$ mile west of; at right of pipe-line trail in heavy timber; iron post, marked "420 S.F."	420.035

BROWN SCHOOLHOUSE TO RESERVOIR ROAD.

Township line between Ts. 8 and 9 S., R. 2 W., between secs. 36 and 1; ground at gate, across road	2,370.00
Reservoir road, at junction with; near county line, in Mrs. Gist's yard, at north side of gate; iron post, marked "2256 S.F."	2,255.959

NAPA, SOLANO, AND SONOMA COUNTIES.

NAPA QUADRANGLE.

The elevations in the following list are based on a bronze tablet in east face of southeast corner of the foundation of the public schoolhouse at Benicia, marked "35," the true elevation being 34.548 feet. (See Appendix to Eighteenth Annual Report.)

The leveling was done under the direction of Mr. L. C. Fletcher, topographer, by Mr. L. D. Ryus, levelman.

FAIRFIELD, VIA COUNTY ROAD, TO VACAVILLE.

	Feet.
Fairfield court-house, $\frac{1}{2}$ mile north of; nail in post at east end of bridge over small ditch	16.96
Fairfield, 1 mile northeast of; at fork of road to Elmira; nail in top of post at north side of west end of bridge over ditch	25.54
James Lockey's house, at fork of road to west; spike in foot of guy post to telegraph pole	58.57
Thomas Dixon's barn, in front of; nail in sleeper at gatepost	89.64
Fairfield, $3\frac{1}{2}$ miles northeast of; east of road at foot of hill at bend; nail in foot of telegraph pole	151.30
Tolenas Springs, opposite fork of road to; spike in foot of telegraph pole	206.13
Tolenas Springs, fork of road to; south side of gate; iron post, marked "205"	205.323
Branson's house, $\frac{1}{2}$ mile northeast of; east side of road; spike in foot of telegraph pole	287.87
C. H. Steinmetz's orchard, 400 feet east of southwest corner of; in solid sandstone ledge north of bend in road; copper bolt, marked "U.S.G.S. 280 ft. B. M."	279.658
Water tank, at northwest corner of; 300 feet south of northwest corner of orchard; nail in sill	246.71
Laguna schoolhouse, 400 feet south of; opposite fork of road; spike in foot of telegraph pole	238.34
Laguna Creek, chisel mark at north side of east end of sandstone culvert over	215.56
Butcher's ranch, 300 feet north of; spike in northeast corner, in sill of water tank	175.27

	Feet.
Parker's ranch, southwest corner of, at fork of roads; chisel mark on highest part of corner stone	171.60
Vacaville, south of, west of road; nail in top of city-limit post	178.71
Vacaville, intersection of College avenue and Main street, north of bridge over Ulatis Creek; spike in foot of telegraph pole	176.08
Vacaville, at northwest corner of public school building, 4 feet above ground; bronze tablet, marked "188"	187.717

VACAVILLE, VIA COUNTY ROAD AND PLEASANT VALLEY, TO WINTERS.

	Feet.
Vacaville, 1 mile west of; at intersection of Buck avenue and Valley road, opposite Wyckoff gate; chisel mark on corner stone	193.86
Vacaville, 1.5 miles west of; southeast corner of Montgomery's orchard; chisel mark on corner stone	207.19
Packardo House, 10 feet south of road to; spike in foot of telegraph pole	209.611
Burnham's ranch, 300 feet west of northeast corner of, on south side of fork of road; nail in root of oak tree 4 feet in diameter	238.92
Barrow's ranch, northeast corner of, at forks of road; nail in top of corner post	242.15
Alamo school, opposite; nail in sleeper at northeast corner of water tank	273.14
Alamo school, 30 feet northwest of woodshed, in grounds; iron post, marked "266"	265.555
Collier's house, 50 feet south of gate to, 20 feet west of road; spike in foot of oak tree 18 inches in diameter	339.05
Ulatis Creek, 300 feet north of Buck's house, 100 feet north of road forks; top of bolt at southeast corner of bridge	358.60
Uhl's pasture, 150 feet east of road at bend; nail in root of live-oak tree 3 feet in diameter	376.99
Schulke's house, opposite; nail in knot at foot of oak tree 40 inches in diameter	406.68
Oakdale school, 150 feet north of, 40 feet west of road; nail in root of oak tree 3 feet in diameter	417.19
Oakdale school, northwest corner of grounds; iron post, marked "426"	426.308
Thurber's barn, 250 feet north of, west side of road; spike in root of oak tree 30 inches in diameter	304.58
Pleasant's barnyard, 100 feet east of northeast corner of, at fork of road; nail in root of walnut tree	251.99
Pleasant Valley school, southeast corner of grounds; iron post, marked "257"	256.689
Miller Creek, floor of bridge over	242.00
Pleasant Valley school, ½ mile north of; north side of gate to orchard of old Pleasant place; spike in foot of telegraph pole	243.38
Winters, 5 miles southwest of, at road north to Puta Creek; nail in foot of telegraph pole	195.63
Winters, 4½ miles southwest of; north side of road, 300 feet west of house of old Finch place; iron post, marked "169"	169.328
Winters, 3 miles southwest of; west bank of Puta Creek at ford; nail in base of willow tree at lower edge	132.89
Winters, 2½ miles west of; 300 feet east of Slade's house; nail in foot of gatepost	171.37
Winters, 1½ miles west of; north side of road at fork to dry houses and barn; nail in top of post	149.50
Winters, ½ mile west of; at intersection of road and old railroad grade; spike in foot of telegraph pole	143.71

	Feet.
Winters, 150 feet southeast of large gum tree in front of David Judy's house, at corner of fence; nail in base of telegraph pole	130.13
Southern Pacific Railroad crossing; top of rail	130
Winters, 10 feet from fence at north side of grounds of public school; iron post, marked "132"	131.599

FORKS OF COUNTY ROAD, 2½ MILES WEST OF WINTERS, VIA COUNTY ROAD UP PUTA CREEK TO STONE BRIDGE OVER PUTA CREEK, 1½ MILES SOUTH OF MONTICELLO.

Winters, 2½ miles west of; 450 feet east of house at forks of road; nail in base of telegraph pole	168.86
Winters, 3½ miles west of; 30 feet south of road, opposite white house across Puta Creek; nail in root of oak tree 36 inches in diameter	168.83
Winters, 4½ miles west of; in northwest corner of stone culvert over ravine at old Seely place; copper bolt, marked "U.S.G.S. 179 feet B.M."	178.505
Winters, 5½ miles west of; 20 feet from creek bank, south of road and opposite round top peak; nail in root of live-oak tree	180.71
Corner stone, Yolo, Solano, and Napa counties; north bank of Puta Creek, on bench east side of rock 3 inches below top; copper bolt, marked "U.S.G.S. 212 ft. B.M."	212.272
County line, 1 mile west of; 4 feet east of road at point of hill, opposite orchard on side hill, south of Puta Creek; nail in root of oak tree	295.66
County line, 2 miles west of; west of road at mouth of canyon and 400 feet east of house; nail in foot of oak tree 30 inches in diameter	253.92
County line, 3 miles west of; south of road at point of hill, west end of cut; nail in root of live-oak tree	243.84
Wragg Canyon, 1 mile east of mouth of; south side of road opposite bend in creek; nail in oak tree 36 inches in diameter	253.76
Wragg Canyon, mouth of; south side of road, 200 feet east of summit of grade; nail in knot of oak tree	349.04
Summit of grade	350.00
Wragg Canyon, east of; at fork of road; iron post, marked "306"	306.128
Wragg Canyon, 1 mile west of mouth of; south of road and 50 feet southwest of Kennedy's house; nail in knot of forked live-oak tree	291.85
Wragg Canyon, 2 miles west of mouth of; 20 feet north of road, 1,000 feet east of ford, opposite Councilman's house; nail in root of oak tree 4 feet in diameter	283.68
Monticello stone bridge, 2½ miles east of; 30 feet south of road, 400 feet east of cut; nail in oak tree 18 inches in diameter in oak grove	277.58
Monticello stone bridge, 1½ miles east of; south of road, 50 feet west of road crossing Puta Creek; nail in knot on oak tree 18 inches in diameter.	308.34
Monticello, 1 mile south of; at forks of main road to Winters, Napa, and Monticello; nail in root of oak tree 4 feet in diameter	322.36
Monticello, 1¼ miles south of; in top of stone tablet in center of south side of Monticello stone bridge over Puta Creek; bronze tablet, marked "309"	308.643

MONTICELLO STONE BRIDGE, VIA CAPELL CREEK, SODA CREEK, MOONEY RANCH, AND SAGE CANYON, TO ST. HELENA.

Monticello stone bridge, 1 mile south of; 600 feet west of house and windmill, ½ mile north of Brock place; nail in root of oak tree 4½ feet in diameter	305.80
Monticello stone bridge, 2 miles south of; chisel mark on northwest corner of stone culvert	326.57

	Feet.
Monticello stone bridge, 2½ miles south of; west side of road, 75 feet north of ravine, ¼ mile north of Capell Creek; nail in root of oak tree 40 inches in diameter	336.71
Monticello stone bridge, 3 miles southwest of; 400 feet south of bridge over Capell Creek; nail in root of oak tree	356.76
Forks of roads to Napa, Rutherford, and Monticello, 300 feet south of; 150 feet west of old house; nail in root of oak tree 4 feet in diameter	377.21
Mooney's ranch, 4 miles northeast of; 20 feet south of road, 250 feet west of ford at Capell Creek, 4 feet below top of bank; nail in root of live-oak tree	389.67
Capell Creek, ½ mile west of ford, at east end of cut in slate bluff north side of creek	414
Mooney's ranch, 3 miles northeast of; 50 feet from north bank of Capell Creek, 50 feet east of second ford, 300 feet south of stone house; nail in 12-inch alder tree on gravel bar	417.82
Mooney's ranch, 2¼ miles northeast of; ¾ mile southwest of second ford of Capell Creek, on east bank of creek and west of road; nail in foot of oak tree 3 feet in diameter	454.01
Mooney's ranch, 1¾ miles east of; at fork of road to Capell post-office; chisel mark on sharp rock at foot of oak tree 28 inches in diameter	520.61
Mooney's house, ¼ mile south of; east of road, opposite southwest corner of orchard, 200 feet northwest of bridge; nail in root of live-oak tree 18 inches in diameter	710.52
Mooney's ranch, ½ mile northwest of; ¼ mile southwest of Chiles post-office, east of road on hill; nail in knot of live-oak tree	849.66
Mooney's ranch, 1 mile west of; ¼ mile east of house, 300 feet west of summit; nail in foot of oak tree 30 inches in diameter	991.40
Mooney's ranch, 1 mile west of, north side of road at summit, 100 feet west of road to Priest's house, iron post, marked "991"	991.170
Sage Creek, at west end of bridge, 400 feet north of first fork road to Chiles's mill; nail in top of 12-inch alder stump	847.33
Sasselli house, ½ mile southwest of, north side of road at small flat; nail in knot of stump	832.27
First fork of road to Chiles's mill, 2 miles west of, south side of road, 100 feet northeast of small house on hillside; nail in knot of live-oak tree	597.57
First fork road to Chiles's mill, 2½ miles west of, north side of road and 20 feet from fork of road to south crossing of creek; nail in root of forked live-oak tree	516.59
Sage Creek, new bridge, ½ mile west of, on grade northwest of house on old road on opposite side of creek; nail in knot of 12-foot stump 8 feet high	439.33
Sage Creek, new bridge, 1,500 feet west of, 100 feet north of road in small flat; nail in root of pine tree	328.55
Sage Creek, at mouth of Chiles Creek, west side of bridge, in ledge of rock forming north abutment; copper bolt stamped "U.S.G.S. 280 feet B.M"	279.516
McMillan's house, 250 feet east of gate; nail in root of oak tree 4 feet in diameter	273.94
McMillan's house, 1 mile west of, north side of road; nail in root of oak tree, which is part of a wire fence	222.46
Conn Creek, ½ mile east of bridge over, east side of road; nail in knot of forked oak tree	194.70
Conn Creek, spike in top of fourth pile in south wing of west end of bridge over	178.71

	Feet.
St. Helena, 3½ miles east of, west side of road and ¼ mile south of private road to west; nail in stump at foot of live-oak tree	191.67
St. Helena, 3¼ miles east of, 30 feet north of gate to Goldstein's house; nail in root of live-oak tree	194.43
St. Helena, 2¼ miles east of, 400 feet north of creamery, west side of road; nail in top of stump	213.14
St. Helena, 1¼ miles east of, west side of road, ¼ mile south of stone bridge; nail in root of leaning live-oak tree	218.23
St. Helena, 1 mile east of, in north wall, 25 feet east of west end of stone bridge over Napa Creek; bronze tablet, marked "221"	221.099
St. Helena, ½ mile east of, south side of road, opposite second house from bridge; nail in root of oak tree	214.93
St. Helena, ¼ mile south of, 50 feet north of railroad crossing, 20 feet east of cooper shop; spike in foot of telegraph pole	235.28
St. Helena, southwest corner of Main and Adams streets, in wall at north side of J. R. Kettlewell's hardware store, 1.7 feet above sidewalk, 1.5 feet from corner; bronze tablet, marked "255"	254.742

ST. HELENA, VIA SOUTHERN PACIFIC RAILROAD, TO NAPA.

St. Helena, ½ mile south of; top of rail at switch to winery	236.00
St. Helena, ¾ mile south of, west of road and next to picket fence in front of Dr. Crane's place; in oak tree 4 feet in diameter	228.44
Zinfandel winery, 300 feet north of, east side of road, 40 feet west of track, opposite small white house; nail in knot of oak tree	199.30
Ink's house, 200 feet southeast of, 15 feet east of track on right of way, 200 feet south of main road crossing; iron post, marked "176"	175.656
Rutherford, 1¼ miles north of; east side of road against fence opposite hydrant for sprinkler; nail in root of oak tree	159.34
Rutherford, southeast corner of station, at foot of signal post; chisel mark in slab	171.49
Rutherford school, north of, 300 feet east of track; nail in root of oak tree 3 feet in diameter	169.68
Milepost 84, spike in	161.00
Rutherford, 1 mile south of, 150 feet east of track, east side of road; nail in root of oak tree 4 feet in diameter	142.00
Oakville, 140 feet east of track, between two saloons and opposite Tokalon vineyard; nail in root of oak tree 4½ feet in diameter	150.44
Oakville, 100 feet west and 50 feet south of station, at west side of grounds against fence; iron post, marked "153"	153.129
Oakville, 1 mile south of, at center of platform in front of Benson House; spike in foot of tree	140.93
Oakville, 1½ miles south of, 600 feet south of milepost 81; top of bolt in foot of whistle post	168.01
Yountville, 1¼ miles north of, 30 feet east of track, 50 feet west of road at point of hill; nail in root of 4-foot oak tree	181.22
Yountville, 900 feet north of post-office, 400 feet south of trestle; spike in foot of whistle post	110.12
Yountville, 1 mile southwest of, in brick flue of electric-light plant at Veterans' Home, 5 feet above ground; bronze tablet, marked "165"	165.012
Columbia Hotel, southwest of; top of bolt in base of whistle post	81.56
Culvert H, nail in top of signboard	73.08
Milepost, 77, spike in foot of	75.03
Magnolia, top of rail at switch	90.00

	Feet.
Trubody, top of rail opposite station	84.00
Oak Knoll school, 150 feet north of bridge, 30 feet east of track; nail in root of tree	95.51
Oak Knoll school, 30 feet northwest of, in grounds next to fence; iron post marked "100"	99.558
Oak Knoll school, ½ mile south of, opposite gate to vineyard; spike in foot of telegraph pole	104.01
Oak Knoll, top of rail opposite station	106.00
Oak Knoll, ¼ mile south of, east of track, 500 feet south of milepost 75; spike in root of tree	96.95
Plass ranch, north of, opposite cross fence; iron bolt in foot of telegraph pole	79.34
Union, 150 feet south of station, east of track; top of iron bolt in base of whistle post	71.99
Union, opposite station, west side of road at fence; iron post, marked "75"	75.349
Napa, top of bolt at foot of whistle post at Vallejo street	15.42
Napa, top of rail opposite station	15.00
Napa, 400 feet south of station, at road crossing; iron bolt in base of whistle post	14.81
Napa, in wall at northeast corner of court-house, facing Broom street, 1 foot south of corner stone, 3.7 feet above walk; bronze tablet, marked "20"	20.369
Napa, south of station; iron bolt in foot of city-limit signboard	11.80

NAPA, VIA SOUTHERN PACIFIC RAILROAD, TO THOMPSON STATION.

Napa, ½ mile south of, east of track, 450 feet south of road crossing, 4 feet from fence; nail in root of tree	9.89
Culvert C, spike in foot of sign board	4.48
Napa, 2 miles south of, 400 feet north of Lone Tree farm, 150 feet south of trestle; nail in top of peg at foot of telegraph pole	4.45
Lone Tree farm, top of rail opposite station	7.00
Napa, 2.5 miles south of, 150 feet west of track, 75 feet north of windmill; nail in root of oak tree	4.57
Napa, 3 miles south of, in pasture 250 feet east of track, opposite old wharf; nail in root of oak tree	6.21
Thompson, top of rail at switch	7.00

CORDELIA ALONG COUNTY ROAD, VIA ROCKVILLE AND WOODEN VALLEY, TO J. W. REAM'S RANCH.

Cordelia, 1 mile north of; nail in timber at southeast corner of water tank	23.49
Cordelia, 2 miles north of, ½ mile south of Rockville; nail in foot of telegraph pole	50.39
Rockville, 1 mile north of; nail in cap timber at northwest corner of bridge over Suisun Creek	78.44
Rockville, 2 miles north of, at southeast corner of almond orchard; nail in foot of fence post	95.01
Suisun Valley school, ¼ mile north of; nail in corner post of fence at bend to northeast	117.51
R. F. Williams's blacksmith shop, 50 feet north of; nail in foot of fence post at corner	116.51
County line, ¼ mile south of; north side of road at foot of hill on creek bank; chisel mark on rock	178.75

	Feet.
County line, ¾ mile north of; at northwest corner of vineyard east of road; nail in foot of corner post	229.10
County line, 1.5 miles north of; north side of road, 125 feet east of gate to J. W. Ream's house; iron post, marked "228"	227.962

FORKS OF ROAD AT MOUTH OF SODA CREEK, VIA PRIVATE ROAD UP CAPELL CREEK, TO CAPELL POST-OFFICE.

Summit of first ridge, 50 feet south and 75 feet east of; chisel mark on rock ledge	597.25
Capell, 5 miles north of; at side of fork of road east to house 1,000 feet west on hillside; chisel mark on rock	745.82
Capell, 4½ miles north of; 300 feet south of house opposite orchard; nail in knot of oak tree 4 feet in diameter	642.10
Burrow's house, 300 feet south of; in ledge in sidehill south side of ravine and west of road; copper bolt, marked "U.S.G.S. 641 ft. B.M."	641.059
Capell, 3.5 miles northwest of; 20 feet west of road, 600 feet south of new barn; nail in root of white oak tree 12 inches in diameter	701.91
Wilcox's house, 50 feet west of; west side of road; nail in root of oak tree 20 inches in diameter	695.21
Capell school, 400 feet north of; 150 feet east of road in field; nail in base of oak tree 6 feet in diameter	748.61
Capell; 40 feet west of gate to, 30 feet north of Napa road, 300 feet south of post-office; nail in root of tree	807.37
Capell; 1,200 feet west of post-office, 300 feet west of forks of road, in rocky bluff; copper bolt, marked "U.S.G.S. 872 ft. B.M."	872.183

FORKS OF SAGE CANYON AND CONN VALLEY ROADS NORTH TO CONN VALLEY SCHOOL.

Conn Valley school, 1 mile south of; on ridge between two ravines, 600 feet west of road; nail in root of oak tree	283.20
Conn Valley school; 40 feet north of southeast corner, in grounds near fence; iron post, marked "319"	319.235

ST. HELENA, VIA COUNTY ROAD, TO MOUTH OF SULPHUR SPRINGS CANYON.

St. Helena; corner of Spring street and Oak avenue; top of curb	240.00
St. Helena, 1 mile west of; north side of road against fence at center of curve, 600 feet west of northwest corner of cemetery; iron post, marked "299"	299.033

YOUNTVILLE, VIA COUNTY ROAD NORTHEAST 2 MILES, TO CHILES VALLEY ROAD.

Yountville, 1 mile northeast of; south of road, between Napa Creek and small creek east; nail in root of oak tree	89.58
Yountville, 2 miles northeast of; against fence north side of road, 300 feet from forks; iron post, marked "142"	141.847

NAPA, VIA COUNTY ROAD EAST AND NORTH, TO CEDAR KNOLL FARM.

Napa, 1 mile northeast of; west side of road at roadhouse; nail in root of gum tree	46.25
Napa, 2 miles northeast of; sharp point on rock at south side of masonry of bridge over small creek, west side	40.37

	Feet.
Napa, 3 miles northeast of; 100 feet north of road in pasture, at fork road to Olive Hill ranch; nail in root of oak tree 4 feet in diameter	101.11
Cedar Knoll farm; in stone gatepost at entrance to; bronze tablet, marked "155."	154.981

ASYLUM STATION, ALONG COUNTY ROAD VIA NAPA INSANE ASYLUM, TO HARMONY SCHOOL.

Napa Insane Asylum; in front of main building; top of iron bolt at foot of lamp-post	62.12
Napa Insane Asylum, 1 mile east of; chisel mark on top of Coast and Geodetic Survey monument	123.46
Harmony school, 100 feet south of, 4 feet from fence; iron post, marked "121"	120.991

NAPA, VIA BROWNS VALLEY, TO VINEYARD STATION.

Napa; at northeast corner of Brown and Division streets; iron bolt at foot of telegraph pole	12.25
Napa; at northeast corner of Third and Randolph streets; nail in top of post at foot of tree	17.00
Napa, 1 mile west of; north of road between gates in front of Chapman's house; nail in root of tree	57.98
Townsend House, opposite and 75 feet west of gate; nail in foot of fence post	130.38
Browns Valley school, in front of; top of bolt in sleeper at foot of southwest corner of water tank	166.65
Browns Valley school, 1 mile southwest of; west of road on hill; nail in knot of 8-inch oak tree 8 inches in diameter	299.75
Browns Valley school, 2 miles southwest of; 300 feet southwest of small vineyard; nail in sleeper at southwest corner of bridge	207.54
Browns Valley school, 3 miles southwest of; at fork of road up Carneros Creek; chisel mark at east end of stone culvert	139.79
Browns Valley school, 4 miles southwest of; at angle of road on flat marsh land; spike in foot of telegraph pole	131.18
Halfway House, in front of; 150 feet east of stone bridge; nail in knot of oak tree 40 inches in diameter	112.77
Halfway House, 1 mile west of; north side of road on hill, 1,000 feet west of crossroads; spike in foot of telegraph pole	139.53
Halfway House, 2 miles west of; chisel mark at east end of north side of stone bridge, near top of railing	93.13
Glaister's house; 50 feet east of gate; nail in root of leaning oak tree	219.71
Huichica school; west side of grounds, 4 feet from fence at west side of ravine; iron post, marked "217"	217.340
Dresel winery, opposite gate to; in angle of road; spike in foot of telegraph pole	103.10
Dresel winery, 300 feet south of west gate to; west side of road; nail in root of oak tree	58.61
Vineyard, top of rail at; north end of station at railroad crossing	49.00
Vineyard; 200 feet north of station, east of track; nail in root of locust tree	50.56

VINEYARD, VIA CALIFORNIA AND NORTHWESTERN RAILWAY, TO BUENA VISTA, THENCE TO SONOMA.

	Feet.
Buena Vista, opposite station; spike in foot of telegraph pole	106.63
Cemetery, gate to; spike in foot of telegraph pole	94.20
Sonoma; at First and Napa streets, in side wall of F. Deloring & Co.'s store, 2.7 feet above sidewalk and 5 feet north of rear door; bronze tablet, marked "83"	82.565

SONOMA, VIA CALIFORNIA AND NORTHWESTERN RAILWAY, TO GLEN ELLEN.

Sonoma; top of rail opposite station	97.00
Sonoma, 1 mile north of; 300 feet northwest of small house; nail in foot of large fence post	91.28
Sonoma, 1½ miles north of; top of rail at main road crossing	109.00
Elverano; spike in northeast corner post of platform of station	127.19
Caliente, ½ mile south of; west side of track, opposite bath house; nail in foot of 30-inch oak tree	124.14
Caliente; top of rail opposite station	130.00
Caliente, 1 mile north of; south end of curve in vineyard, 300 feet south of trestle; spike in foot of whistle post	154.92
Yulupa station, at junction with Southern Pacific Railroad; top of rail	165.00
Madrone winery; spike in foot of signal post at crossing	170.40
Eldridge; top of rail opposite station	191.00
Eldridge; 150 feet west of station, north side of walk; nail in root of oak tree 12 inches in diameter	185.79
California Home for Feeble-Minded; in granite capstone at south side of entrance to Bentley Hall; bronze tablet, marked "234"	234.390
Ping ranch; in front of stone barn, west side of road and 150 feet west of track; nail in root of oak tree 3 feet in diameter	209.51
Glen Ellen; bolt in top of iron pier at north side of west end of iron bridge over Sonoma Creek	223.77
Glen Ellen; top of rail opposite station	227.00

SONOMA, VIA COUNTY ROAD NORTH AND EAST TO SECTION 31, TOWNSHIP 6 NORTH, RANGE 5 WEST.

Sonoma, 1 mile east of; 40 feet south of fence corner on bank of Creek; chisel mark on rock	197.23
Sonoma, 2 miles east of; in ledge 4 feet high projecting from bank, 4 feet east of bank of ravine, 100 feet north and 150 feet west of road; aluminum bolt, marked "U.S.G.S. 232 ft. B.M"	231.759

GLEN ELLEN, ALONG COUNTY ROAD VIA WARFIELD, KENWOOD, AND MELITTA, TO SANTA ROSA.

Glen Ellen, 500 feet north of station; east of road, 300 feet north of turnpike; nail in root of oak tree 36 inches in diameter	241.30
Warfield, ½ mile north of; in front of A. C. Babkirk's house; nail in root of oak tree 4 feet in diameter	289.79
Dunbar school, top of hill west of; 300 feet west of gate; nail in root of oak tree in fence	363.85
Dunbar school, 25 feet north and 100 feet west of; in ground near fence; iron post, marked "350"	350.415
Hodges house, at foot of hill north of; on bank east of road; nail in top of oak stump	418.30
Wildwood; top of rail opposite station	408.00

	Feet.
Wildwood, 300 feet north of station; 75 feet east of track; nail in root of oak tree	410.05
Kenwood Hotel, 1,000 feet east of, at fork road; nail in root of oak tree	419.25
Kenwood public school; northeast corner of grounds; iron post stamped "412"	412.335
Kenwood, 1 mile north of; west of road, 600 feet north of bridge over creek; nail in root of oak tree 28 inches in diameter	442.00
Kenwood, 2 miles north of; east side of road; nail in east side of forked oak tree	488.23
Kenwood, 3 miles north of; north of road opposite Hutchinson's barn; nail in root of oak tree 50 inches in diameter	439.11
Kenwood, 4 miles north of; west of road on bank opposite vineyard; nail in root of oak tree 30 inches in diameter	419.94
Melitta, 1 mile south of; at angle in road west of white house; nail in root of oak tree 36 inches in diameter	372.53
Melitta, 50 feet north of post-office; west side of road; nail in root of oak tree 20 inches in diameter	314.96
Melitta, 125 feet east of post-office; northeast side of road, 125 feet north of bridge; iron post, marked "319"	319.211
Melitta, 1 mile north of; spike in foot of southeast corner post of water tank	284.01
Melitta, 2 miles north of; north side of road opposite C. Stridde's house; nail in root of oak tree 32 inches in diameter	267.84
Santa Rosa, 2.5 miles east of; 300 feet south of road house, on bank west of road; nail in root of live-oak tree	248.98
Santa Rosa, 2 miles east of, 150 feet west of pumping station, south of road; iron post, stamped "203"	202.947
Santa Rosa; at corner of McDonald and College avenues and Fourth street, 30 feet south of gate to city garden; top of Perkins's hydrant	177.33
Santa Rosa; in north wall of court-house, 2.5 feet above pavement, at west side of steps leading to second floor, 23 feet from entrance on Fourth street side; bronze tablet, marked "165"	164.977

SANTA ROSA, ALONG COUNTY ROAD VIA GWYNS CORNERS, BURK'S SANITARIUM, MARK WEST SPRINGS, TARWATER AND FRANZ VALLEY SCHOOLS, TO CALISTOGA.

Santa Rosa, 1½ miles north of; at fork roads; nail in root of oak tree 30 inches in diameter	152.19
Santa Rosa, 2½ miles north of; opposite gate to vineyard at Fountains Grove; spike in foot of telegraph pole	138.39
Santa Rosa, 3½ miles north of; nail in foot of southeast corner post of water tank	146.86
Gwyns Corners; at well at fork of roads; nail in root of maple tree	156.33
Burk's sanitarium; 25 feet north of gate at entrance; nail in root of gum tree	213.65
Burk's sanitarium; 30 feet west of entrance, north side of road; iron post, marked "210"	210.350
Burk's sanitarium, 1 mile north of; 100 feet north of white gate at corner of pasture; chisel mark on stone	302.23
Burk's sanitarium, 1.2 miles north of; west side of road on hill 50 feet from gate; nail in root of oak tree, 36 inches in diameter	399.84
Burk's sanitarium, 2.5 miles north of; west of road, 50 feet from gate, in board fence in low flat at foot of hill; nail in root of oak tree	543.22

	Feet.
Mark West Springs, 2 miles south of; west of road in curve 500 feet north of house, on hill 100 feet south of fork of road to creek; chisel mark on stone	453.43
Mark West Springs, 1 mile south of; west of road on side hill; nail in top of hollow redwood stump	429.33
Mark West Springs, ½ mile northeast of; 100 feet west of road, in pasture at small bridge; nail in oak tree 40 inches in diameter	457.53
Mark West Springs, 1½ miles northeast of; at forks of road ¼ mile south of Tarwater school; nail in root of oak tree 30 inches in diameter	487.55
Tarwater school, ⅛ mile southwest of; at west side of road forks; iron post, stamped "490"	490.118
Mark West school, 400 feet west of; south of road; nail in top of stump	492.01
Mark West Springs, 2 miles northeast of; east of road at southwest corner of picket fence; nail in root of oak tree 36 inches in diameter	677.27
Tarwater Hill summit, east of road at fence in front of old cabin; iron post, marked "1050"	1,050.292
O'Brien's meadow, southeast corner of, at top of steep incline; nail in root of oak tree 36 inches in diameter	758.74
Clark's house, 400 feet east of; nail in root of oak tree 40 inches in diameter	518.97
Franz Valley school, 50 feet south of, north of road; nail in root of oak tree 10 inches in diameter	737.13
Franz Valley school, 1 mile northeast of, south of road at summit on county line; iron post, marked "970"	970.456
Calistoga, 3¼ miles west of, north of road, 50 feet west of old house; nail in root of oak stump 20 inches in diameter	723.72
Calistoga, 2¼ miles northwest of, 200 feet southeast of forks of road, east of road on bank of ravine at foot of hill; nail in root of oak tree	471.39
Calistoga, 1¼ miles west of, ⅛ mile west of bridge, north of road; nail in root of forked oak tree	387.48
Calistoga, east side of first street east side of Main street, at southwest corner of fence around small square house; nail in root of gum tree	347.23
Calistoga, 25 feet west of southwest corner of Lincoln avenue and Main street, in sidewalk; iron post, marked "354"	353.679

CALISTOGA, ALONG COUNTY ROAD, TO ST. HELENA.

	Feet.
Calistoga, 1 mile southeast of, 100 feet east of fork road at roadhouse; nail in foot of telegraph pole	315.37
Calistoga, 1¾ miles southeast of, 400 feet east of water tank; nail in root of oak tree 2 feet in diameter	303.38
Calistoga, 3 miles southeast of, 900 feet south of large house west of road; nail in root of oak tree 3 feet in diameter	301.59
Calistoga, 4 miles southeast of, east of road at milepost 4; nail in root of oak tree 30 inches in diameter	324.91
Calistoga, 4 miles southeast of, in center of cap at east side of stone bridge over Ritchie Creek; bronze tablet, marked "338"	338.389
Calistoga, 5 miles south of, 150 feet south of milepost 5; nail in root of oak tree	309.13
St. Helena, 3 miles north of, west of road, 300 feet south of water tank, 100 feet north of bridge over ravine; nail in root of oak tree 30 inches in diameter	292.89
St. Helena, 2 miles northwest of; nail in sill at southwest corner of water tank	231.47
St. Helena, 1 mile north of, west of road, 125 feet south of bridge over ravine; nail in root of oak tree 30 inches in diameter	270.47

OREGON.

ARLINGTON TO SNAKE RIVER, NEAR HUNTINGTON, VIA OREGON RAILROAD AND NAVIGATION COMPANY.

The elevations in the following list are a continuation of those which commenced at Astoria and were published in the Appendix to the Twentieth Annual Report, pp. 474–481.

The leveling was done by Mr. H. S. Crowe, duplicate rods being used. A branch line was run from Umatilla to Pasco, to connect with the levels carried from Tacoma along the Northern Pacific Railway. The distance from Astoria to Pasco is 328 miles and from Tacoma to Pasco is 254 miles, making a total distance of 582 miles from Astoria to Tacoma by the route followed in running the levels. The discrepancy at Pasco was 1.918 feet. While this is large, it is not certain that it is all due to the leveling, as the connection at Tacoma with the plane corresponding to mean sea level was somewhat indefinite.

The first five bench marks in the list below are identical with the last five of the preceding year, the elevations being slightly changed, however.

ARLINGTON TO UMATILLA.

	Feet.
Arlington, 80 feet east of station, 30 feet south of main track, 40 feet north of switch, 50 feet west of tool house, 50 feet northwest of warehouse No. 7, and 400 feet west of section house; iron post, marked "225 A"	224.786
Milepost 143, railroad spike on	218.65
Milepost 144, railroad spike on	217.43
Milepost 145, railroad spike on	219.42
Arlington, 4 miles east of, 30 feet east of fifth telegraph pole west of milepost 146, 100 feet south of railroad track, 20 feet south of granite bowlder; iron post, marked "225 A"	224.726
Milepost 147, railroad spike on	222.71
Milepost 148, railroad spike on	231.20
Milepost 149, railroad spike on	225.83
Milepost 150, railroad spike on	229.38
Milepost 151, railroad spike on	229.02
Heppner Junction, 18 feet west of west corner of depot, 10 feet south of track; iron post, marked "240 A"	240.399
Trestle 218, base of rail	241.48
Milepost 153, 270 feet east of; railroad spike on west post of extra rail support	252.58
Milepost 154, 720 feet east of; railroad spike on telegraph pole	230.64
Milepost 155, railroad spike on	233.91
Milepost 156, railroad spike on	237.52
Milepost 157, 360 feet east of, 21 feet south of center of track, above small fill on hillside; iron post, marked "240 A"	239.587
Milepost 158, railroad spike on	237.33
Milepost 159, railroad spike on	238.22
Milepost 160, railroad spike on	236.02
Milepost 161, railroad spike on	241.19
Castle Rock, 90 feet east of east end of depot, 15 feet south of milepost 162; iron post, marked "240 A"	240.453

	Feet.
Castle Rock, at section house, base of rail center of track	240.87
Milepost 163, railroad spike on	237.67
Milepost 164, railroad spike on	239.31
Milepost 165, railroad spike on	243.18
Milepost 166, railroad spike on first telegraph pole southeast of	244.77
Milepost 167, 75 feet southeast of, 45 feet south of track; iron post, marked "247 A"	247.103
Milepost 168, railroad spike on	248.76
Milepost 169, railroad spike on	259.39
Milepost 170, railroad spike on	251.00
Coyote siding, base of rail at section house	251.80
Milepost 171, 840 feet east of, railroad spike on whistling post	266.42
Milepost 172, 90 feet west of; 21 feet south of center of track; iron post, marked "271 A"	271.403
Milepost 173, railroad spike on	275.29
Milepost 174, railroad spike on	274.48
Milepost 175, railroad spike on	272.87
Milepost 176, railroad spike on	270.25
Milepost 177, 35 feet west of, 36 feet south of center of track; iron post, marked "278 A"	278.232
Milepost 178, railroad spike on	279.61
Milepost 179, railroad spike on	289.53
Milepost 180, railroad spike on	293.38
Milepost 181, railroad spike on	275.58
Milepost 182, 18 feet south of, 30 feet south of center of track; iron post, marked "288 A"	287.854
Milepost 183, railroad spike on	301.50
Milepost 184, railroad spike on	299.96
Milepost 185, railroad spike on	312.26
Milepost 186, railroad spike on	302.44
Umatilla River, base of rail at end of steel bridge	293.28
Umatilla River, water surface	268.66
Umatilla, 48 feet east of northeast corner of water tank in lot between tank and roadmaster's office; 24 feet west of northwest corner of roadmaster's office, 25 feet north of center of track; iron post, marked "294 A."	294.140
Umatilla, ¼ mile east of station at center of track at junction, east end of railroad yard; road crossing	297.13
Umatilla, top of rail center of station	293.90

UMATILLA TO PENDLETON.

Umatilla, ¼ mile east of, at junction of railroads; railroad spike on second telegraph pole east of road crossing	300.10
Milepost 188, railroad spike on	323.10
Milepost 189, railroad spike on	362.42
Milepost 190, railroad spike on	401.40
Milepost 191, railroad spike on	430.34
Milepost 192, 9 feet southeast of, 24 feet south of center of track; iron post, marked "451 A."	451.044
Milepost 193, railroad spike on	461.73
Maxwell, base of rail center of track	455.13
Milepost 194, railroad spike on	463.73
Milepost 195, railroad spike on	511.93

	Feet
Milepost 196, railroad spike on	557.81
Milepost 197, 90 feet northeast of, 55 feet north of center of track, 4 feet southeast of telegraph pole; iron post, marked "590 A."	590.462
Milepost 198, railroad spike on	633.05
Milepost 199, railroad spike on	621.70
Milepost 200, 60 feet northeast of; railroad spike on brace post of telegraph pole	615.76
Milepost 201, railroad spike on	606.51
Foster siding, 3 feet east of east corner of fence at section house, 120 feet northeast of milepost 202; iron post, marked "591 A."	590.781
Milepost 203, railroad spike on	621.99
Milepost 204, copper nail on plug opposite	616.72
Milepost 204, railroad spike on telegraph pole at third curve east of	618.22
Milepost 205, railroad spike on	631.79
Echo, top rail in front of depot	636.35
Echo, first crossing east of; railroad spike on signpost	635.40
Milepost 206, railroad spike on	642.48
Echo, 1⅜ miles east of, 21 feet northeast of center of track, 50 feet east of crossing; iron post, marked "656 A."	655.682
Milepost 207, 340 feet northeast of; railroad spike on whistle post	663.72
Trestle 5, base of rail center of	672.09
Trestle 6, base of rail center of	678.72
Milepost 208, 180 feet northeast of; railroad spike on second telegraph pole	679.41
Trestle 7, base of rail center of	600.20
Trestle 7, head of drift bolt on south end of cap of fifth bent from west end	688.71
Milepost 210, railroad spike on	714.69
Trestle 11, base of rail	717.56
Milepost 211, railroad spike on	756.68
Trestle 13, base of rail center of	752.18
Umatilla River, base of rail center of trestle	737.81
Umatilla River, iron bridge over, near Nolan siding; on cap of trestle approach at first bent of span	735.74
Nolan siding, 4 feet south of fence at road crossing, 54 feet northeast of center of track; iron post, marked "732 A."	732.349
Milepost 213, 1,200 feet east of, at west end of Thorough Cut; railroad spike on brace post of telegraph pole	763.03
Trestle 17, base of rail center of	769.40
Trestle 18, base of rail	788.89
Milepost 214, railroad spike on	800.09
Trestle 19, base of rail center of	805.00
Trestle 20, base of rail center of	817.71
Trestle 21a, base of rail center of	825.91
Trestle 21, base of rail center of	832.31
Milepost 215, railroad spike on	832.27
Trestle 22, base of rail center of	827.60
Trestle 23, base of rail center of	807.20
Milepost 216, railroad spike on	793.71
Trestle 26, base of rail center of	811.80
Milepost 217, railroad spike on	820.71
Trestle 27, base of rail center of	828.98
Trestle 28, base of rail center of	840.48

	Feet.
Milepost 217, 0.6 mile east of, 27 feet south of center of track, 15 feet north of fence; iron post, marked "847 A."	846.809
Milepost 218, at Horseshoe Curve; railroad spike in	848.53
Milepost 219, 250 feet northeast of; railroad spike on telegraph pole	858.08
Bridge 30, base of rail center of	853.24
Bridge 30, 90 feet from east end of; head of boat spike on south guard rail	853.66
Bridge 32, base of rail center of	870.59
Bridge 32, north end of; copper nail on east bulkhead timber	870.97
Milepost 221, railroad spike on	877.21
Trestle 33, base of rail center of	883.66
Milepost 222, railroad spike on	900.14
Trestle 34, base of rail center of	894.86
Barnhart siding, 230 feet west of west end of warehouse, 6 feet west of sign post "Barnhart," 20 feet south of track; iron post, marked "908 A."	907.572
Trestle 35, base of rail	911.07
Milepost 224, 2,000 feet east of, 10 feet north of center of track; cross on sharp corner of rock	935.43
Trestle 36, base of rail center of	956.01
Trestle 36, bolt head on east end of south guard rail	956.68
Milepost 226, railroad spike on	954.20
Milepost 227, railroad spike on	969.40
Pendleton, 3 miles west of, 2 feet east of gate in fence at road crossing, 72 feet north of track; iron post, stamped "994 A."	993.714
Trestle, base of rail center of	1,077.17
Milepost 229, railroad spike on	1,021.75
Trestle 40, base of rail center of	1,050.82
Umatilla River, west end of bridge 41; head of boat spike on north guard rail	1,049.27
Pendleton, in front of depot; base of rail	1,065.96
Pendleton, in second block of pilaster base of west entrance of south side of Umatilla County court-house, facing Alta street; iron post, marked "1074 A."	1,074.167

PENDLETON TO LAGRANDE.

Trestle 47, base of rail center of	1,076.79
Trestle 48, base of rail center of	1,088.12
Milepost 232, railroad spike on	1,110.06
Trestle 49, base of rail center of	1,133.73
Milepost 233, opposite, at edge of bank 8 feet north of center of track; copper nail in plug	1,124.10
Milepost 234, railroad spike on	1,139.96
Milepost 235, railroad spike on	1,167.53
Trestle 53, base of rail center of	1,189.26
Milepost 236, 750 feet northeast of, 25 feet north of center of track, 6 feet east of telegraph pole west of switch for siding; iron post, marked "1205 A"	1,205.140
Mission, base of rail opposite warehouse	1,217.30
Milepost 237, 8 feet north of; copper nail in	1,231.96
Milepost 238, railroad spike in	1,266.35
Trestle 55, base of rail center of	1,325.74
Milepost 239, 1,000 feet east of; copper nail on east end of guard rail south side of trestle 55	1,326.28
Trestle 56, base of rail center of	1,336.75

	Feet.
Milepost 240, railroad spike on	1,340.02
Trestle 57, base of rail center of	1,351.47
Milepost 241, 900 feet west of, 21 feet south of center of track, 2 feet north of fence, 15 feet north of wagon road; iron post, marked "1355 A"	1,354.549
Umatilla River, 330 feet east of west end of bridge, opposite west end of steel span, near Cayuse siding; bolt head on north guard rail	1,405.44
Umatilla River, at center of bridge near Cayuse siding; base of rail	1,405.04
Cayuse siding, base of rail in front of warehouse	1,409.09
Milepost 243, railroad spike on	1,428.60
Trestle 63, base of rail center of	1,466.64
Milepost 244, railroad spike on	1,484.57
Milepost 245, 9 feet north of, in Thorough Cut; → on rock	1,537.96
Trestle 66, base of rail center of	1,522.22
Milepost 246, railroad spike on	1,518.74
Road crossing, 300 feet west of, 15 feet north of track, 4 feet east of telegraph pole; iron post, marked "1523 A"	1,523.457
Signboard "Thorn Hollow," railroad spike on	1,564.56
Bridge 76, base of rail center of	1,572.74
Signboard "Thorn Hollow," 0.7 mile east of, at road crossing, railroad spike on	1,582.79
Trestle 78, base of rail center of	1,606.66
Milepost 249, railroad spike on	1,614.60
Milepost 250, railroad spike on	1,649.03
Trestle 81, base of rail center of	1,691.29
Trestle 81, first bent from west end of; railroad spike on north end of cap.	1,689.42
Trestle 82, base of rail center of	1,694.43
Trestle 83, base of rail center of	1,713.85
Milepost 252, railroad spike on	1,725.88
Bingham Springs, base of rail in front of depot	1,743.46
Bingham Springs, 158 feet east of east corner of depot, 36 feet north of center of track, 45 feet east of road crossing, 4 feet east of first telegraph pole from depot; iron post, marked "1744 A"	1,744.331
Milepost 253, railroad spike on	1,763.26
Milepost 254, opposite, at wes tend of bridge over Meacham Creek; bolt on north guard rail	1,820.02
Trestle 80, base of rail center of	1,832.83
Milepost 255, railroad spike on	1,856.60
Milepost 256, railroad spike on	1,903.02
Milepost 257, railroad spike on	1,948.06
Trestle 95, base of rail center of	1,954.79
Milepost 258, railroad spike on	1,995.72
Milepost 258, ½ mile east of, 22 feet south of track, 35 feet east of whistling post; iron post, marked "2023 A"	2,022.666
Milepost 259, railroad spike on	2,048.55
Trestle 99, base of rail center of	2,073.73
Trestle 100, base of rail center of	2,107.13
Milepost 260, railroad spike on	2,098.88
Trestle 104, base of rail center of	2,161.12
Trestle 104; steamboat spike on south end of cap of east bulkhead bent	2,159.61
Milepost 262, 500 feet east of; railroad spike on whistling signpost	2,215.77
Wilbur siding, at Wilbur section house; base of rail center of track	2,265.04
Wilbur; 150 feet east of section house, at corner of fence near telegraph office, 32 feet south of center of track; iron post, marked "2264 A"	2,263.933

	Feet.
Milepost 264, railroad spike on	2,327.27
Trestle 108, base of rail center of	2,333.39
Milepost 265, railroad spike on	2,385.67
Milepost 266, 50 feet southwest of; + on rock	2,441.47
Milepost 267, railroad spike on	2,505.33
Bridge 115, 540 feet east of east end of, 30 feet south of center of track, 5 feet east of telegraph pole; iron post, marked "2570 A"	2,570.054
Thorough cut, west end of, 20 feet south of center of track; railroad spike on fir stump 6 inches in diameter	2,642.46
Milepost 270; railroad spike on	2,704.61
Milepost 271, 120 feet east of; railroad spike on north end of west bulkhead timber on trestle 127	2,777.93
Milepost 272, opposite; railroad spike on top timber of breakwater	2,846.44
Signboard "Huron," 300 feet west of, 30 feet south of center of track, 45 feet west of tool house, 85 feet east of water tank; iron post, marked "2906 A"	2,906.363
Milepost 273, railroad spike on	2,912.72
Trestle 133, base of rail center of	2,930.85
Trestle 136, railroad spike on south end of west bulkhead timber	3,037.36
Milepost 275, railroad spike on	3,134.52
Bridge 145, base of rail center of Howe truss span	3,191.20
Milepost 276, nail in stake on plug at	3,243.45
Milepost 277, railroad spike on	3,350.84
Milepost 278, 12 feet east of, 15 feet south of center of track; iron post, marked "3454 A"	3,454.043
Milepost 279, railroad spike on	3,559.64
Tunnel 4, center of track at west portal	3,593.47
Tunnel 4, center of track at east portal	3,600.35
Milepost 280, railroad spike on	3,657.89
Meacham, 5 feet west of west end of platform, 15 feet north of center of track, 2 feet south of fence around log cabin eating house; iron post, marked "3672 A."	3,672.488
Milepost 281, 690 feet east of, 7 feet north of center of track; + on bowlder 3 by 1 foot by 5 inches	3,698.47
Milepost 282, railroad spike on	3,744.52
Milepost 283, railroad spike on	3,846.63
Milepost 284, 30 feet southwest of, 24 feet south of center of track; iron post, marked "3958 A."	3,958.15
Milepost 285, railroad spike on	4,057.23
Kamela, 1.5 feet south of platform, 44 feet east of northeast corner of telegraph office, 1.5 feet west of west corner of tank building, 14 feet south of center of track; iron post, marked "4199 A."	4,198.753
Milepost 287, railroad spike on	4,153.87
Milepost 288, 300 feet east of; railroad spike on south end of east bulkhead cap of trestle 173	4,029.93
Milepost 289, railroad spike on	3,926.41
Milepost 290, railroad spike on	3,813.93
Milepost 291, railroad spike on	3,695.26
Milepost 292, 120 feet east of; 18 feet south of center of track; iron post, marked "3581 A"	3,581.466
Milepost 293, railroad spike on	3,468.13
Milepost 294, railroad spike on	3,353.96
Bridge 192, 20 feet west of east end of; bolthead on south guard rail	3,245.95

	Feet.
Milepost 296, railroad spike on	3, 121. 52
Grande Ronde River, bridge; base of rail center of span	3, 060. 29
Milepost 297, railroad spike on	3, 025. 30
Hilgard, 2 feet west of first telegraph pole west of depot, 24 feet north of center of track; iron post, marked "3001 A"	3, 001. 089
Hilgard, top of north rail at depot	3, 002. 04
Milepost 298, railroad spike on	2, 974. 37
Milepost 299, railroad spike on	2, 958. 03
Milepost 300, railroad spike on	2, 944. 64
Milepost 301, railroad spike on	2, 913. 51
Perry, 2 feet east of east end of office of Grande Ronde Lumber Co., 45 feet north of center of track; iron post, marked "2897 A"	2, 896. 586
Milepost 302, railroad spike on	2, 876. 35
Milepost 303, railroad spike on	2, 847. 38
Milepost 304, railroad spike on	2, 821. 93
Milepost 305, railroad spike on	2, 787. 08
Lagrande, crossing at Fourth street	2, 782. 11
Lagrande, top of rail in front of telegraph office	2, 778. 40
Lagrande, 165 feet northeast of road crossing at First street, 30 feet north of northwest corner of railroad tool house, 4 feet west of telegraph pole; iron post, marked "2773 A"	2, 773. 245
Lagrande, corner Chestnut street and Adams avenue, in third course of plaster facing of brick wall on Chestnut street side of Foley Hotel; aluminum tablet, marked "2782 A"	2, 781. 679

LAGRANDE TO BAKER CITY.

Lagrande, 1 mile east of; railroad spike on second telegraph pole southeast of signpost "Yard Limits"	2, 750. 48
Milepost 307, railroad spike on	2, 740. 38
Milepost 308, railroad spike on	2, 723. 96
Milepost 309, railroad spike on	2, 710. 44
Milepost 310, railroad spike on	2, 703. 11
Milepost 311, railroad spike on	2, 698. 18
Milepost 311, 3,600 feet east of; 50 feet south of center of track, 1 foot north of fence; iron post, marked "2696 A"	2, 696. 012
Milepost 312, railroad spike on	2, 696. 41
Trestle 220, base of rail center of	2, 696. 58
Trestle 211, base of rail center of	2, 695. 77
Trestle 222, base of rail center of	2, 695. 39
Trestle 222, railroad spike on north end of cap of first bent from west end	2, 693. 27
Milepost 314, railroad spike on	2, 693. 11
Hot Lake, base of south rail	2, 695. 33
Milepost 315, railroad spike on	2, 694. 40
Hot Lake, 1.8 miles east of; railroad spike on signpost at crossing	2, 703. 62
Milepost 317, 55 feet northeast of; 5 feet west of telegraph pole, 7 feet south of fence; iron post, marked "2705 A"	2, 705. 473
Union, top of rail in front of depot	2, 710. 85
Union, 75 feet east of station; railroad spike on signboard at road crossing.	2, 709. 53
Milepost 318, railroad spike on	2, 711. 40
Milepost 319, railroad spike on	2, 791. 85
Trestle 247, base of rail center of	2, 851. 07
Snowsheds, center of track at west portal	2, 855. 49

	Feet.
Snowsheds, center of track at east portal	2,868.64
Rock 12 by 4 inches 15 feet north of center of track, + on	2,892.99
Milepost 321, railroad spike on	2,941.17
Second snowshed east of Union, 1,000 feet west of; 15 feet south of track, 4 feet west of fence of cattle guard; iron post, marked "3021 A"	3,020.971
Milepost 323, railroad spike on	3,089.29
Milepost 324, railroad spike on	3,167.54
Milepost 325, opposite; railroad spike on telegraph pole	3,243.18
Milepost 326, 360 feet east of; at end of small thorough cut, 10 feet south of track; copper nail on plug	3,329.54
Telocaset, at road crossing west of; 10-penny nail in bulkhead timber on west end of trestle of west cattle guard	3,388.52
Telocaset, base of rail in front of telegraph office	3,440.76
Telocaset, 3 feet east of east corner of fence at section house, 18 feet north of center of track; iron post, marked "3440 A"	3,439.695
Milepost 329, railroad spike on	3,387.30
Milepost 330, railroad spike on	3,333.83
Trestle 263, base of rail center of	3,326.30
Trestle 265, base of rail center of	3,293.26
Milepost 331, 6 feet east of; railroad spike on north end of cap at east end of bridge 265	3,291.44
Trestle 266, base of rail center of	3,284.57
Trestle 268, base of rail center of	3,273.84
Trestle 269, base of rail center of	3,267.83
Milepost 332, railroad spike on	3,251.25
Milepost 332, ½ mile south of; 180 feet north of north portal of tunnel 5; 14 feet east of track; iron post, marked "3228 A"	3,228.254
Tunnel 5, center of track at north portal	3,225.09
Tunnel 5, center of track at south portal	3,220.97
Milepost 333, railroad spike on	3,200.41
Bridge 270, base of rail center of	3,186.67
Milepost 334, railroad spike on	3,185.84
Milepost 335, railroad spike on	3,210.29
Trestle 275, head of driftbolt on north cap of east bulkhead bent	3,216
North Powder, base of rail in front of telegraph office	3,234.98
North Powder, 120 feet southwest of station, 32 feet south of center of track at northeast corner of fence, 15 feet south of wagon road; iron post, marked "3235 A"	3,234.681
Milepost 338, railroad spike on	3,260.35
Milepost 339, railroad spike on	3,286.69
Trestle 282, base of rail center of	3,295.01
Milepost 340, railroad spike on	3,317.79
Milepost 341, 90 feet east of; railroad spike on whistle signpost	3,349.04
Milepost 342, 28 feet north of, 42 feet north of center of track; iron post, marked "3372 A"	3,372.249
Milepost 343, railroad spike on	3,369.18
Trestle 284, base of rail center of	3,354.12
Milepost 344, railroad spike on	3,343.58
Trestle 285, base of rail center of	3,339.70
Trestle 286, base of rail center of	3,330.59
Milepost 345, railroad spike on	3,328.14
Trestle 287, base of rail center of	3,326.37
Trestle 288, base of rail center of	3,326.60

	Feet.
Haines, 500 feet north of station; railroad spike on third telegraph pole	3,325.31
Haines, ½ mile south of; 45 feet east of track, at north edge of Baker City sheet, in stone masonry; bronze tablet, marked "3322 A"	3,321.699
Trestle 292, base of rail center of	3,321.50
Milepost 349, railroad spike on	3,330.20
Milepost 350, railroad spike on	3,337.76
Milepost 351, railroad spike on	3,338.59
Wingville, 1.5 miles north of; 65 feet west of track; 600 feet east of Jennings's house on main road between Haines and Baker City; iron post, marked "3338 A"	3,338.201
Milepost 352, railroad spike on	3,344.98
Trestle 298, base of rail center of trestle	3,348.07
Milepost 353, railroad spike on	3,355.46
Milepost 354, railroad spike on	3,365.69
Milepost 355, railroad spike on	3,382.59
Milepost 356, railroad spike on	3,402.68
Milepost 357, railroad spike on	3,422.77
Baker City, top of east rail in front of station	3,427.34
Baker City, + on north stone pier of water tank	3,428.37
Baker City; in astronomical pier in front yard of public school; bronze tablet, marked "3433 A"	3,432.700

BAKER CITY TO HUNTINGTON.

Trestle 301, near east end of; head of drift bolt on north cap of last bent	3,446.77
Milepost 359, railroad spike on	3,481.15
Trestle 308, base of rail center of	3,506.77
Milepost 360, railroad spike on	3,525.50
Trestle 309, base of rail center of	3,526.27
Milepost 361, railroad spike on	3,558.31
Milepost 362, railroad spike on	3,598.94
Norton Siding, 150 feet north of section house; iron post, marked "3646 A"	3,645.753
Milepost 364, 600 feet east of; 14 feet south of track, at west end of thorough cut; wire nail on plug	3,727.88
Milepost 365, 235 feet east of; at east end of bridge 311; head of boat spike on north guard rail	3,800.64
Trestle 312, base of rail center of	3,841.24
Milepost 366, railroad spike on	3,863.79
Milepost 367, railroad spike on	3,944.49
Milepost 368, railroad spike on	3,914.02
Milepost 369, railroad spike on	3,848.32
Pleasant Valley; 15 feet south of west corner of railroad house, 50 feet south of depot, 99 feet south of track; iron post, marked "3818 A"	3,818.220
Milepost 370, railroad spike on	3,782.12
Milepost 371, railroad spike on	3,725.08
Trestle 315, base of rail center of	3,689.18
Thorough cut, near west end of; 12 feet north of track, 1,500 feet east of change of line in canyon; nail in plug	3,598.01
Milepost 373, railroad spike on	3,524.81
Trestle 318, base of rail center of	3,438.38
Milepost 374, 0.3 mile east of; boat spike on whistle post	3,378.69
Trestle 319, base of rail center of	3,298.79
Bridge 319, east end of; ship spike on south guard rail	3,295.19
Trestle 320, base of rail center of	3,137.26

	Feet.
Bridge 320, near east end; ship spike on north guard rail	3,137.26
Unity; 185 feet north of section house, at forks of road; iron post, marked "3139 A"	3,138.52
Unity, top of north rail at section house	3,122.65
Milepost 378, railroad spike on	3,083.54
Milepost 379, railroad spike on	2,971.84
Bridge 323, south end of; boat spike on east guard rail	2,839.08
Milepost 381, railroad spike on	2,808.12
Trestle 224, base of rail center of	2,733.13
Milepost 382, railroad spike on	2,731.24
Milepost 383, railroad spike on	2,663.00
Trestle 327, base of rail center of	2,645.95
Durkee; 30 feet east of telegraph office, 36 feet north of track, 1 foot west of southwest corner of fence at section house; iron post, marked "2647 A"	2,646.742
Milepost 385, railroad spike on	2,611.22
Milepost 386, railroad spike on	2,575.73
Milepost 387, railroad spike on	2,551.81
Milepost 388, railroad spike on	2,537.38
Wagon road, 14 feet south of; 24 feet north of track, 4 feet south of fence; iron post, marked "2518 A"	2,518.477
Milepost 390, railroad spike on	2,469.91
Milepost 391, 600 feet south of; at end of trestle 341; head of drift bolt on north end of cap at south bent	2,440.66
Weatherby siding, ¼ mile north of; at road crossing; boat spike on south end of west guard rail of bridge 343	2,409.03
Milepost 393, 0.1 mile east of; railroad spike on whistling post for tunnel 6.	2,383.34
Tunnel 6, 600 feet west of west end of; 40 feet north of track, 8 feet from east corner of fence; iron post, marked "2369 A"	2,368.825
Tunnel 6, center of track at east portal	2,357.80
Tunnel 6, center of track at west portal	2,362.41
Milepost 395, railroad spike on	2,319.02
Milepost 396, ¼ mile east of; near end of thorough cut; 20-penny wire nail on whistle signpost	2,291.16
Bridge 354, north end of; head of boat spike on west guard rail	2,267.42
Milepost 398, railroad spike on	2,250.48
Milepost 399, railroad spike on	2,227.30
Bridge 356, 360 feet south of; 30 feet east of railroad track, 13 feet west of fence; iron post, marked "2215 A"	2,214.899
Milepost 401, railroad spike on	2,192.16
Milepost 402, railroad spike on	2,165.44
Milepost 403, 30 feet east of; boat spike on south guard rail at east end of trestle 364	2,145.29
Milepost 404, railroad spike on	2,118.28
Huntington, Washington street; in sixth row of brick above stone foundation, second row of horizontal bricks, in front of brick building of Oregon Commercial Company, near stairway between grocery and drug store; aluminium tablet, marked "2105 A"	2,105.237
Huntington, top of rail in front of station	2,101.357

HUNTINGTON TO SNAKE RIVER BRIDGE.

	Feet.
Huntington, 0.7 mile east of; north of track; 20-penny nail on hardwood station post	2,089.44
Trestle 380, west end of; head of drift bolt on north guard rail	2,080.07
Snake River, base of rail center of bridge	2,079.55
Snake River, 3.5 feet east of west end of steel bridge, on stone stringer; aluminum tablet, marked "2079 A"	2,078.520

UMATILLA TO PASCO.

	Feet.
Umatilla, ¼ mile east of, east of road crossing at junction; railroad spike on telegraph pole	300.10
Milepost 188, railroad spike on	310.79
Milepost 189, railroad spike on	312.97
Milepost 190, railroad spike on	337.47
Milepost 191, railroad spike on	359.02
Milepost 192, 45 feet north of, 15 feet north of track; iron post, marked "378 A"	377.998
Milepost 193, 90 feet northeast of, 10 feet south of track; copper nail in plug	400.29
Milepost 194, railroad spike on	410.43
Milepost 195, railroad spike on	421.39
Milepost 196, 150 feet east of; railroad spike on whistling post	399.45
Milepost 197, railroad spike on	375.98
Cold Springs siding, 57 feet west of southwest corner of section house, 25 feet north of center of track; iron post, marked "362 A"	361.674
Milepost 199, railroad spike on	340.71
Milepost 200, $\frac{1}{10}$ mile east of; railroad spike on signpost for road crossing	323.71
Milepost 201, 480 feet northeast of, 8 feet north of center line opposite east end of sand spur, north side of track; + on large rock	317.07
Milepost 202, railroad spike on	309.73
Milepost 203, 60 feet east of; spike on tie	314.85
Juniper, 4 feet west of west corner of fence at section house, 18 feet northeast of center of track; iron post, marked "313 A"	312.751
Trestle 217 over Juniper Creek, base of rail	316.77
Milepost 204, railroad spike on	318.86
Milepost 205, railroad spike on	306.36
Milepost 206, railroad spike on	313.51
Milepost 207, railroad spike on	317.40
Oregon-Washington line, opposite signboard marking base of rail center of track	316.01
Milepost 208, 150 feet east of; 570 feet east of State line post, 18 feet south of track; iron post, marked "318 A"	317.882
Milepost 209, railroad spike on	323.12
Milepost 210, railroad spike on	340.67
Milepost 211, railroad spike on	344.71
Milepost 212, railroad spike on	333.30
Milepost 213, railroad spike on	321.48
Wallawalla River, center of steel bridge; base of rail	321.56
Wallula, 18 feet north of center of station; 290 feet north of south end of bridge, 27 feet south of center of track at Northern Pacific connection; iron post, marked "322 A"	322.012
Milepost 245, railroad spike on	319.87
Milepost 244, railroad spike on	341.32

	Feet.
Milepost 243, opposite; railroad spike on west post of extra rail support	340.71
Milepost 242, railroad spike on	321.88
Milepost 241, railroad spike on	327.18
Milepost 240, 120 feet southeast of; 36 feet east of track, 5 feet east of telegraph pole; iron post, marked "341 A"	341.396
Milepost 239, railroad spike on	329.97
Milepost 238, railroad spike on	330.90
Milepost 237, railroad spike on	336.21
Milepost 236, 90 feet northeast of; 42 feet east of center of track, 5 feet north of telegraph pole; iron post, marked "342 A"	341.655
Milepost 235, railroad spike on	341.46
Snake River, center of draw span of bridge; base of rail center of track	356.67
Snake River, 60 feet south of drawspan pier of railroad bridge; bolt head on east guard rail	357.71
Milepost 233, railroad spike on	344.89
Milepost 232, railroad spike on	359.54
Pasco, in northwest corner of brick roundhouse of Northern Pacific Railroad Company, in center of third row of bricks above foundation; aluminum tablet, marked "378 T., 376 A"	376.144

BAKER AND UNION COUNTIES.

Baker City Quadrangle.

During the field season of 1898 the levels run were based on a bench mark in the astronomical pier in front yard of the public school in Baker City, the elevation of which was accepted as 3,446.597, being derived from the elevation given by the Oregon Railroad and Navigation Company on rail in front of station in Baker City as 3,441 feet. During the field season of 1899 the double-rodded line of levels which was started from Astoria during the preceding season was continued so as to go through the Baker City quadrangle. From this the elevation of the bench mark in the astronomical pier in Baker City was determined to be 3,432.700 feet. All levels published herewith are based on the Astoria datum, but the permanent bench marks, except those immediately along the railroad, are stamped in accordance with the elevations determined the first season.

The leveling was done under the direction of Mr. R. H. McKee, topographer, by Mr. W. R. Manning, levelman.

BAKER CITY, VIA POCAHONTAS SCHOOLHOUSE, TO HAINES.

	Feet.
Baker City, in yard and at east side of brick public schoolhouse, in top of small masonry pier; bronze tablet marked "3433 A"	3,432.7000
Baker City, in front of Oregon Railroad and Navigation Company station, top of rail	3,427.1
Baker City, 1⅓ miles west of; opposite white house owned by Mr. Garren; surface of road	3,411.00
Baker City, 5 miles northwest of; intersection of roads at James's schoolhouse	3,434.00
Baker City, 7 miles northeast of; about 200 feet east of road, at William Brown's house; ground	3,519

	Feet.
Pocahontas schoolhouse, about 300 feet west of; at right angle in road; iron post, marked "3673 B.C."	3, 658. 933
Pocahontas schoolhouse, 1¼ miles north of; on west side of road and about 250 feet northwest of N. S. Irwin's house; nail in root of 28-inch pine tree	3, 627. 57
Pocahontas schoolhouse, 2 miles northeast of; about ½ mile east of cemetery; surface of ground at intersection of roads running north, south, and west	3, 509. 00
Wingville, 1½ miles west of; 40 feet south of intersection of roads running north, south, and east and about 200 feet northeast of yellow house; nail in root of 30-inch pine tree	3, 503. 32
Haines, 1¼ miles southeast of; in corner of fence and ¼ mile south of house owned by C. C. Olson; on peg at west side of road	3, 329. 1
Haines, 1 mile southeast of, west side of road and about 20 feet southeast of the corner of C. C. Olson's house; iron post, marked "3342 B. C."	3, 328. 573
Haines, in front of Oregon Railroad and Navigation Company station; top of rail	3, 326. 3
Haines, 1 mile north of, 70 feet northeast of Mr. Richman's house, west side of road; iron post, marked "3334 B. C."	3, 320. 308

HAINES, VIA FLAGSTAFF WELL, TO BAKER CITY.

Wingville, 1½ miles northeast of, south side of road, 65 feet west of Oregon Railroad and Navigation Company crossing and 600 feet east of Mr. Jennings's house; iron post, marked "3338 A."	3, 338. 201
Baker City, 4½ miles north of, by fence ¼ mile west of schoolhouse; nail in peg at north side of road	3, 338
Flagstaff well, 1⅛ miles northwest of, on west side of road and southeast of intersection of roads running northeast, southwest, northwest, and southeast; nail in peg	3, 352. 6
Baker City, 6½ miles northeast of; ground on east side of road at Flagstaff well	3, 373
Flagstaff mine, 1¼ miles west of, north side of road and east of intersection of roads running east, west, and north; chisel mark on sand stone.	3, 479. 28
Flagstaff mine, 1¼ miles west of, north side of road and east of intersection of roads running east, west, and north; iron post, marked "3495 B. C."	3, 481. 002

HAINES, VIA SLOUGH HOUSE, TO SCHOOLHOUSE 4½ MILES NORTH OF BAKER CITY.

Haines, east of; road crossing of Powder River; surface of water	3, 298. 00
Haines, 3⅛ miles southeast of; summit of road	3, 483. 00
Haines, 4¼ miles southeast of; 2 miles northwest of Slough House, in fork of roads running northeast and southeast; iron post, marked "3351 B. C."	3, 337. 325
Slough House, ground at; west side of road and southwest of bridge over slough	3, 327. 00
Haines, 7 miles southeast of; 50 feet west of road and 100 feet east of house owned by Mr. Clark; iron post, marked "3344 B. C."	3, 330. 388

BAKER VALLEY, VIA UPPER BRIDGE IN LOWER POWDER RIVER VALLEY, TO BIG CREEK ON ROAD TO UNION.

Baker Valley, summit of road east of	3, 579. 00
Miles Ranch, 4 miles southwest of; west side of road and about 600 feet southwest of beginning of steep descent; iron post, marked "3553 B.C."	3, 539. 606
Upper bridge in Lower Powder Valley, 1½ miles west of; summit of road.	3, 178. 00

	Feet.
Upper bridge in Lower Powder Valley; water surface of Powder River	2,741.00
P. H. Miles's house, road in front of	2,779.00
P. H. Miles's house, 1,100 feet east of; at intersection of roads running northeast, southeast, and southwest, in corner of wire fence; nail in peg	2,798.9
Big Creek, 1½ miles southeast of; ½ mile southwest of intersection of roads running northwest to Union, southeast to Sparta, and southwest to Baker City, east side of road and close to the corner of a rail fence and a wire fence; nail in peg	3,155.3
Big Creek, about 1 mile southeast of; surface at intersection of roads running northwest to Union, southeast to Sparta, and southwest to Baker City	3,104.00
Big Creek, ½ mile southeast of; surface at intersection of roads running north to Union, south to Sparta, and east to Sanger	3,116.00
Big Creek, just south of; ground at house owned by Mr. Sam, on east side of road	3,102.00
Big Creek, road crossing; water surface at bridge	3,097.00
Big Creek, ¼ mile north of; at junction with road running northeast to Medical Springs	3,132.00
Big Creek, 0.4 mile north of; summit of road	3,187.00
Big Creek, 0.9 mile northwest of; road crossing of Beagle Creek; water surface	3,143.00
Big Creek, 1 mile northwest of; 0.2 mile west of Beagle Creek, east side of road and 125 feet north of right angle in road; iron post, marked "3191 B. C."	3,177.766
Big Creek, 2½ miles northwest of; 125 feet southeast of J. J. Turner's house; nail in peg in bend of road, by fence	3,252.1

BIG CREEK, VIA VICINITY OF TABLE MOUNTAIN, TO KEATING POST-OFFICE.

Big Creek, 2 miles southeast of; on road to Sparta, 800 feet north of summit of road, about 50 feet west of road, 300 feet south of drain, opposite and 100 feet from telephone pole; chisel mark on sandstone	3,262.37
Big Creek, 2½ miles southeast of; surface of junction with road running east, just south of house on west side of road	3,212.00
Table Mountain, 1 mile southeast of; on top of a rocky hill 250 feet east of a road running north and south and ¼ mile north of a road running east and west; aluminum tablet, marked "3452 B.C"	3,439.1
Keating post-office, 1 mile northwest of; south side of road and near fourth telephone pole east of Tod Merwin's house; nail in peg	2,673.00
Keating post-office, ½ mile northwest of; at crossing of Clover Creek, on bridge	2,665.00
Keating post-office, 50 feet south of corner of house, in post-office yard, at corner of fence; iron post, marked "2695 B.C"	2,680.946
Keating post-office, 1¼ miles east of; on road to Sparta, near twelfth telephone pole east of summit of steep ascent; nail in peg	2,794.1

P. H. MILES'S RANCH, VIA EMILY SCHOOLHOUSE, TO ERWIN SCHOOLHOUSE.

Emily schoolhouse, in Lower Powder Valley, 15 feet northeast of; 80 feet southwest of road; iron post, marked "2788 B.C"	2,774.113
Emily schoolhouse, 2 miles southeast of; 820 feet southeast of house owned by H. W. Lee, at junction of roads, by fence, on south side of road; nail in peg	2,733.7
Erwin schoolhouse, ground at	2,719.00

KEATING POST-OFFICE, VIA PALMER'S HOUSE, ON RUCKLES CREEK, TO FLAGSTAFF MINE.

	Feet.
Keating post-office, ⅓ mile southwest of; copper nail in east abutment of bridge over Powder River	2, 651. 35
Keating post-office, ⅓ mile southwest of; crossing of Powder River; water surface at bridge	2, 644. 00
Keating post-office, 3 miles southwest of; summit of road	2, 962. 00
Keating post-office, 3½ miles southwest of; 5 feet east of milepost 15; nail in peg	2, 997. 6
Ruckles Creek; water surface at bridge crossing	3, 018. 00
Palmer's house, 50 feet northwest of; south side of road and close to milepost 13; iron post, marked "3097 B.C."	3, 084. 156
Flagstaff mine, 3¾ miles southeast of; north side of road and west of a fork running northeast to Erwin post-office; iron post, marked "3341 B.C."	3, 328. 622
Flagstaff mine, west side of and close to hoisting works; surface of road	3, 884. 00
Flagstaff mine, ½ mile southwest of; summit of road to Baker City	3, 671. 00

WHITE SWAN MINE TO UNITY STATION.

	Feet.
White Swan mine, ¾ mile northwest of; at fork in road; nail in peg	3, 617. 2
First Creek, road crossing of; on road to Pritchard Flat, about 1½ miles east of White Swan mine; water surface	3, 505. 00
Second Creek, road crossing of; about 3 miles east of White Swan mine; water surface	3, 583. 00
Second Creek, about 4 miles east of; south side of road and 200 feet west of drain 0.7 mile north of house; nail in peg	3, 473. 9
Pritchard Creek, east of headwaters of; on top of bare ridge, about 1¾ miles north of a house in canyon on west side of Pritchard Creek, ¼ mile west of road running north and south and on south side of dim road running east and west; iron post, marked "3917 B.C."	3, 906. 552
Pritchard Creek; ground at house in canyon on west side of road	3, 385. 00
Pritchard Creek; 1¼ miles south of house in canyon; nail in root of alder tree 10 feet east of road	3, 219. 94
Unity; in front of Oregon Railroad and Navigation Company's railroad station; top of rail	3, 121. 1
Unity Station; 180 feet northeast of section house, in fork of roads and east side of main road; iron post, marked "3151 B.C."	3, 138. 524

UNITY STATION, VIA BURNT RIVER VALLEY, TO THE MOUTH OF CAVE CREEK.

	Feet.
Unity Station, ½ mile southeast of; at road crossing of Oregon Railroad and Navigation Company; top of rail	3, 105. 5
Alder Creek; road crossing 3.1 miles southeast of Unity Station; water surface at bridge	2, 693. 00
Unity Station, 3¼ miles southeast of; surface of ground at intersection of roads running east, west, and north	2, 694. 5
Burnt River Valley, northwest end of; 150 feet north of stone house owned by John Powell; chisel mark on rock	2, 680. 55
Burnt River Valley, about 2 miles northwest of, on east side of wood road leading northwest over mountains from Burnt River Valley, 2¼ miles northwest of stone house owned by John Powell, in top of sandstone in place, 18 by 15 inches and about 3 inches out of ground, near mound of rocks about 4 feet high; aluminum tablet, marked "3912 B. C."	3, 900. 455
Burnt River Valley, upper end of; at bridge across Burnt River, water surface	2, 717. 00

	Feet.
Burnt River Canyon, near mouth of Deer Creek; ground at house owned by T. J. Lander	3,117.00
Burnt River Canyon, 200 feet southwest of T. J. Lander's house; chiseled cross on rock on north side of road near mound of rocks	3,104.82
Burnt River Canyon, at mouth of Cave Creek, west side of road running up east side of Cave Creek; iron post, marked "3126 B. C."	3,113.138

BURNT RIVER CANYON UP DEER CREEK AND OVER DIVIDE TO PLEASANT VALLEY.

Deer Creek; about 2.8 miles north of house owned by T. J. Lander; ground at house on east side of road	3,965.7
Deer Creek, above headwaters of, on flat summit of divide, 5 feet west of road; iron post, marked "5257 B. C."	5,243.669
Pleasant Valley, 5 miles southwest of, near north end of bald ridge, rocky point on northwest side of road; on road opposite	4,859.6

BAKER CITY VIA BOWEN RANCH AND LOCKHART STATION TO HEREFORD.

Baker City, 3.6 miles southwest of, 400 feet southwest of Bowen's house, in forks of road; iron post, marked "3519 B. C."	3,505.281
Baker City, 5 miles southwest of; ground in front of schoolhouse, west side of road	3,540.00
Baker City, 6½ miles southwest of; ground on road in front of house owned by Mr. Shaw	3,579.00
Baker City, 8 miles southwest of, 100 feet west of Price's house; nail in root of 10-inch pine tree	3,622.50
Baker City, 10.3 miles southwest of; at east end of bridge over drain	3,835.4
Baker City, 10.6 miles southwest of; on bridge over drain	3,851.4
Auburn Flume, in deep cut; on bridge over	3,871.6
Auburn, 1.3 miles southeast of; surface of ground at fork of road running west to Prairie City and southwest to Hereford	3,886.00
Auburn, 1.3 miles southeast of, 175 feet south of junction of Prairie City and Hereford roads, on east side of Hereford road and east of white house owned by Mr. Littlefield; iron post, marked "3915 B. C."	3,901.027
Lockhart station, on Sumpter Valley Railroad; on rail at	3,710.00
Lockhart station, at railroad bridge over Powder River; water surface	3,702.00
Lockhart station, 1 mile south of; surface of road in front of schoolhouse	3,892.00
Main divide between Powder River and Burnt River; summit of road between Baker City and Hereford	5,652.00
Main divide between Powder River and Burnt River, 30 feet west of road, summit of road between Baker City and Hereford; iron post, marked "5669 B. C."	5,655.498
Whipple Gulch, 150 feet northwest of mouth of, 50 feet west of road; iron post, marked "4457 B. C."	4,443.618
Big Creek, road crossing just below mouth of Whipple Gulch; on bridge	4,427.00
Big Creek, lower end of valley of; on southwest end of bridge over	4,194.4
Hereford, 4½ miles north of, west of road and near summit, quarter corner between secs. 2 and 11, T. 32 S., R. 38 E.; on top of corner rock	4,529.4
Hereford, 4½ miles north of; summit of road	4,543.00
Hereford post-office, 60 feet southeast of, 75 feet east of road and 150 feet north of Mr. Trimble's house; iron post, marked "3664 B. C."	3,650.448

HEREFORD VIA COUNTY ROAD DOWN BURNT RIVER TO BRIDGEPORT.

	Feet.
Hereford, about 2 miles east of; surface of ground at south side of road in front of Jim Fleetwood's house	3,588.00
Big Creek, road crossing east of Fleetwood's house; water surface	3,587.00
Big Creek, 1.4 miles east of; south side of road on corner of secs. 19, 20, 29, and 30, T. 12 S., R. 38 E.	3,552.00
Brown Gulch; road crossing of dry bed	3,570.00
Brannen Gulch, road crossing; water surface	3,555.00
Hereford, 5.3 miles east of, 30 feet south of road and 80 feet west of house owned by Mr. T. M. Reed, in corner of fence; iron post, marked "3559 B. C."	3,545.418
Pine Creek, road crossing; water surface	3,553.00
Indian Creek; road crossing of dry bed	3,518.00
Cornet Creek, 10 feet west of, 10 feet south of road and 125 feet southeast of house owned by Mr. Clement; nail in root of 20-inch pine tree	3,495.38
Cornet Creek, road crossing; water surface	3,492.00
Mill Creek, 0.1 mile west of; at junction with road running up Mill Creek	3,475.00
Mill Creek, 0.3 mile east of, 10 feet north of road and 75 feet west of dry drain; iron post, marked "3499 B. C."	3,485.579
Bridgeport, ½ mile north of; surface of ground at intersection of roads running north to Baker City, south to Bridgeport, and west to Hereford	3,406.00
Bridgeport; on north end of bridge over Burnt River	3,374.00
Bridgeport, bridge over Burnt River; water surface	3,368.00
Bridgeport; ground at hotel on east side of street	3,381.00
Bridgeport, ½ mile southwest of; ground at schoolhouse	3,405.00

BRIDGEPORT VIA STAGE ROUTE TO BOWEN RANCH NEAR BAKER CITY.

Bridgeport, about 1.3 miles north of; ground at house on east side of road	3,485.00
Bridgeport, 3.8 miles north of; ground at Arrastra mill on west side of road	3,846.00
Divide between Burnt River and Powder River, main summit of road between Baker City and Bridgeport, 10 feet west of road and 160 feet north of junction with dim road running southwest; iron post, marked "6127 B.C."	6,113.429
Beaver Creek; bridge over, south end of	3,674.2
Beaver Creek, 0.6 mile north of crossing of; ground at house 100 feet west side of road	3,665.4
Bowen ranch, 2.2 miles south of; road in front of house 200 feet west of road	3,570.00
Bowen ranch, 1.6 miles south of; road in front of house 150 feet east of road	3,530.00
Bowen ranch, 0.7 mile south of; crossing of Powder River, water surface at bridge	3,506.00
Bowen ranch, 0.6 mile south of, crossing of Sumpter Valley Railroad; on rail	3,508.3

ANTELOPE CREEK ALONG SUMPTER VALLEY RAILROAD TO WATER TANK WEST OF CALIFORNIA GULCH.

Antelope Creek, near mouth of; on north rail at road crossing	3,625.6
Bennett station, on east end of siding; north rail at switch	3,649.4
Denny Creek, near mouth of; north rail at railroad station	3,682.00
Lockhart station, 0.3 mile east of; on north rail on Bridge No. 36, over Powder River	3,693.6

	Feet.
Lockhart station; on north rail at road crossing	3,707.9
Lockhart station, ½ mile west of; on north rail on bridge No. 40, over Poker Creek	3,727.6
Lockhart station, 1.3 miles west of; on north rail at road crossing north of white house	3,750.4
California Gulch, ½ miles east of; on north rail on railroad bridge over Powder River	3,836.2
California Gulch; on north rail opposite mouth of	3,851.8
California Gulch, 1.2 miles west of; on north rail opposite water tank south side of railroad	3,889.4

WASHINGTON.

KITTITAS AND YAKIMA COUNTIES.

ELLENSBURG QUADRANGLE.

The elevations in the following list are based primarily on an aluminum tablet on the southeast corner of the city hall in Tacoma, the elevation of which was accepted as 109.968 feet above mean sea level. From this bench mark a line of levels was carried along the Northern Pacific Railway during the preceding season, and it is on the bench marks of this line that the levels herein referred to are based.

The leveling was done under the general direction of Mr. A. E. Murlin, topographer, by Mr. H. K. Kalloch, levelman.

ELLENSBURG, VIA KITTITAS VALLEY AND MANASTASH CANYON, TO TOWNSHIP 17 NORTH, RANGE 16 EAST.

	Feet.
Ellensburg, 500 feet northeast of St. Louis brewery, east of road; tack point peg under wire fence	1,497.12
Yakima River; nail in top of planking at west end of bridge over	1,510.91
Yakima River; water level under bridge	1,499.5
Schoolhouse, 115 feet east of gate to, 5 feet south of fence, 22 feet west of fence corner, in sec. 10, T. 17 N., R. 18 E.; iron post, marked "1546 T".	1,546.154
Dammon's ranch, on road running west to Manastash Canyon; nail in root of fifth poplar tree west of picket fence	1,572.38
Tonnar's house, 250 feet south of, at corner common to secs. 9, 10, 16, and 15, T. 17 N., R. 18 E., on top of drain over small ditch	1,603.52
Road crossing at corner common to secs. 8, 9, 17, and 16, T. 17 N., R. 18 E.; nail in top of east end of drain over small ditch	1,670.82
Hall's ranch, at front of gate to barn; on top of sunken stone	1,701.94
Quarter corner between secs. 7 and 8, T. 17 N., R. 18 E., 4 feet south of fence, 300 feet northeast of house, north side of road; on top of sunken round stone	1,826.39
Corner stone to secs. 12, 13, 7, and 18, T. 17 N., Rs. 17 and 18 E	1,875.43
Corner common to secs. 11, 12, 14, and 13, T. 17 N., R. 17 E., in middle of road, 750 feet east of white house; nail in root of pine tree 3 feet in diameter	1,970.22
Manastash Creek, 200 feet east of small corduroy bridge over; nail in top of low burnt stump	2,066.65
Deserted frame house, 500 feet southeast of, 5 feet south of road; nail in small burnt stump	2,127.09

	Feet.
Manastash Canyon, first ranch in, 350 feet southwest of house and 35 feet southwest of gate, 15 feet north of road; iron post, marked "2135 T"	2,134.752
Log cabin in small cultivated clearing, 300 feet southwest of, north of road; on top of small lava bowlder	2,170.73
Small corduroy bridge, 80 feet west of, 25 feet south of small watercourse, 30 feet north of rock slide, south of road; nail in root of pine tree 18 inches in diameter	2,299.78
Warner's ranch, 10 feet north of bridge over Manastash Creek, west of forks of creek and east of road; nail in top of low burnt stump	2,363.96
South Fork of Manastash Creek, southeast corner of bridge, ½ mile west of forks of creek; wire nail in top of center of stump 2 feet in diameter	2,429.79
Bort's ranch, 25 feet southeast of first gate west of house, 15 feet south of road; point on rock	2,500.80
Johnson's ranch, 60 feet west of gateway and 100 feet northeast of house, north of road; on top of bowlder	2,577.99
Cultivated field, 250 feet west of gate to; nail in stump on edge of bench	2,680.19
Line between secs. 13 and 14, T. 17 N., R. 16 E., 4 feet south of small fir tree and 300 feet east of wire fence; nail on stump on edge of bench	2,719.23
Cabin in sec. 14, T. 17 N., R. 16 E., 3 feet east of northeast corner of, 165 feet west of section line, 30 feet south of edge of bench above south fork of Manastash Creek, iron post, marked "2731 T"	2,730.952

ELLENSBURG, VIA SHUSHUSKIN CANYON, UMPTANUM, AND WENAS CREEKS, TO SELAH STATION.

Shushuskin Canyon, 1,000 feet west of house at mouth of, in scrub timber; rock in center of road	1,702.82
Shushuskin Canyon, forks of, between road forks; on top of low rock 14 inches in diameter	1,797.12
Old stage or Durr road to Yakima, 140 feet south of junction and 35 feet west of main road; low rock in center of old road	2,381.84
Small gulch running north into head of Shushuskin Canyon, 75 feet southeast of, 6 feet west of road and west of hill top; top point of low flat lava outcrop	2,602.89
Dry creek draining into Umptanum Creek, 100 feet north of, 300 feet northeast of wire fence corner; top of low oblong rock just north of road	2,764.91
Highest point on road at top of flat ridge	2,742.69
Umptanum Creek, southeast end of bridge over dry bed at junction of 3 small ravines near big spring (road leaves creek at this point); nail in top of stringer	2,706.32
Old stage station, 1,000 feet east of, 500 feet north of log cabin, 75 feet south of road; nail in root of most southeasterly of triple pines, each 3 feet in diameter	2,788.
Wenas and Umptanum creeks, summit of divide between, 15 feet south of road; tack point peg under small greasewood brush	3,125.40
Umptanum and Wenas creeks, summit of pass between, 12 feet south of road; iron post, marked "3128 T"	3,127.625
Summit, ½ mile west of, south of road; nail in root of pine tree 2.5 feet in diameter	3,006.47
Bare point of hill at mouth of draw, 150 feet northwest of, 15 feet east of road; nail in root of cottonwood tree 2 feet in diameter	2,684.30
Intermittent stream from spring, 6 feet east of small plank bridge over; on rock	2,589.22
Dry creek bed, at west edge of, 45 feet east of road; nail in stump	2,498.45

	Feet.
Umptanum Creek, 500 feet west of junction with road to, 30 feet south of road and 15 feet north of board fence; nail in root of pine tree 2.5 feet in diameter, on Wenas Creek	2, 267. 36
Kittitas Canyon, mouth of; 1 foot north of fence, 8 feet south of pine tree 3.5 feet in diameter, 45 feet south of road forks, 500 feet southwest of junction of Ellensburg-Yakima road with road up Wenas Creek; iron post, marked "2266 T"	2, 266. 105
White schoolhouse, 350 feet northwest of; in sec. 30, T. 16, R. 17, 25 feet southwest of road, 6 feet northeast of rail fence; stone in ground	2, 105. 49
Burge's ranch, 125 feet northeast of barn, 30 feet southwest of road, 30 feet northeast of fence; nail in root of southernmost tree of small group of young alders	2, 003. 84
Burge's ranch, in T. 16 N., R. 17 E., 65 feet north of east gate to barn, 500 feet southwest of house, 5 feet south of road, in small group of young trees; iron post, marked "2008 T"	2, 008. 156
Jostes' ranch, small rock butte on hill above and ½ mile southeast of; 25 feet southwest of road, 60 feet above creek at bend of road around point of ridge; point of round bowlder, 2.5 feet in diameter	1, 911. 97
Chamberlain's ranch, 1,000 feet west of, in top of flat rock shelf 15 feet south of road, in bend around point of hill; bronze tablet marked "1883 T."	1, 883. 409
Wenas Creek; top of planking of bridge over, at road leading to Chapman's ranch	1, 799. 56
Small board house, yellow trimmings, opposite north of road; nail in top of low post at center of double gate to barn	1, 795. 04
Road forks to North Yakima via Selah Valley and Naches River; rock point at northeast end of bridge	1, 618. 58
Branch of Wenas Creek, 90 feet south of bridge over, at road forks to North Yakima via Selah Valley and Naches River, 2 feet north of fence and 15 feet south of Naches River road; iron post marked "1622 T."	1, 621. 751
Large white house, 1,200 feet southeast of; nail in top of stringer at northwest corner of bridge over dry water course	1, 540. 06
Church north of road, opposite and 35 feet south of road; tack point at east side of stile over wire fence	1, 448. 58
Old Durr road, 25 feet east of, at junction with Wenas road and 50 feet north of main road, 3 feet south of fence, and 450 feet west of Ruby house; iron post marked "1318 T."	1, 317. 872
Harlow house, 200 feet west of; nail in top stringer at northwest corner of 8-foot plank bridge over irrigating ditch	1, 283. 22
Clemmens's ranch, 5 feet northeast of north gate post to barnyard, north of Wenas Creek; tack point peg	1, 221. 43
Wenas Creek, 100 feet north of and 25 feet north of Indian "stick graves;" rock point on edge of rim rock	1, 182. 46
Wenas Creek, mouth of, 30 feet west of Yakima River and northeast of entrance to ford; on low rock point 15 feet southwest of rim rock	1, 133. 91

QUINN'S ROAD, ON WENAS CREEK, SOUTHWEST ACROSS RIDGE TO NACHES RIVER, THENCE TO NORTH YAKIMA.

Large unpainted frame barn, 300 feet northeast of; top planking of bridge over dry creek bed running southeast	1, 590. 13
W. H. Liptrap's store, ¼ mile south of; top of planking over shallow dry drainage running southeast	1, 578. 87
Old well, 25 feet southwest of, 20 feet south of road; top of low rock	1, 632. 64

	Feet.
Wenas Creek and Naches River, summit of pass between, 15 feet southeast of road; tack point peg under sage brush	1,916.34
Wenas Creek and Naches River, summit of pass between, 25 feet southeast of road; iron post marked "1917 T."	1,916.853
Selah irrigating ditch, 6 feet north of east end of bridge over, north side of Naches River Valley; nail in south end of sunken log	1,612.72
Junction of Naches road with road to Wenas Creek, 30 feet southeast of, 6 feet southwest of road in drainage; in top of bowlder 3 feet in diameter.	1,535.50
Schoolhouse yard, 3 feet from fence and 80 feet northwest of fence corner, in sec. 11, T. 14 N., R. 17 E.; on point of low bowlder	1,503.59
Schoolhouse in sec. 11, T. 14 N., R. 17 E., 2 feet northeast of fence, 50 feet southwest of road, 845 feet northwest of lane leading past; iron post marked "1502 T."	1,501.931
Frame house with stone foundation, in cultivated field west of; on top of large pointed conglomerate bowlder	1,486.37
Rowe's house on hill, opposite, south side of road, in sec. 24, T. 14 N., R. 17 E.; tack point peg outside of wire fence	1,557.76
Rowe's ranch, east of; in top planking at west end of bridge over dry creek bed, underneath ditch on east grade of hill	1,460.17
Ravine, 125 feet north of bridge over, between forks of road to hop kiln; nail in top of sunken timber	1,370.24
Schoolhouse, 1,000 feet north of, 5 feet west of junction of Naches road with lane, inside wire fence corner; iron post, marked "1331 T."	1,330.801
Ditch drain across road at turn south and junction with road north past church; nail in top of east end of	1,245.60
House and hop kiln, south of; in top of planking over irrigating ditch	1,197.24
Naches River, 12 feet west of bend of road at end of north approach to bridge over; nail in root of cottonwood tree	1,171.10
Cowiche Creek road crossing, 300 feet north of schoolhouse at, 100 feet west of road, 60 feet east of irrigating ditch siphon, in top of bowlder 5 by 9 feet; bronze tablet marked "1180 T."	1,180.576
White house, 400 feet west of, at road forks 40 feet west of ditch crossing; on top of large rock at fence corner	1,143.80
Road forks, northwest of, north of road at east end of white fence; nail in top of ditch drain	1,118.99
Stone dwelling house, 150 feet northeast of, 6 feet north of fence corner at intersection with road west; on top of rock	1,086.35

KITTITAS CANYON VIA SOUTH FORK OF WENAS CREEK AND NACHES RIVER TO ROAD FROM QUINN'S ROAD, ON WENAS CREEK.

House painted yellowish green, 450 feet west of, south of road; nail in root of twin black pine	2,288.18
Wenas Creek; nail in top of low post at east end of plank bridge over	2,296.97
Horse corral, 300 feet south of, south of road at bend to west; nail in root of pine tree 18 inches in diameter	2,328.95
Foothills, 200 feet north of edge of; northeast of road in timbered flat; nail in low root of black pine 12 inches in diameter	2,402.40
North and south forks of fourth fork of Wenas Creek, at south end of point of ridge dividing, 6 feet south of road in flat; nail in most easterly black pine 2.5 feet in diameter	2,501.17
Point where road leaves flat and climbs over shoulder of ridge, 60 feet south of road; nail in root of yellow pine 4 feet in diameter, in row of 7 large trees	2,805.46

	Feet.
Creek bed, 25 feet south of, north of road on side hill; nail in root at north side of pine tree 16 inches in diameter	2, 907. 92
Old sawmill site, 175 feet east of house at, north of road; nail in center of top of low stump 3 feet in diameter	3, 156. 08
Sawmill site, ¼ mile west of, 12 feet south of road on side hill; nail in root of pine stump 2 feet in diameter	3, 298. 68
Beginning of gradual grade on hill, 6 feet southwest of road, at top of steep grade; nail in root of pine stump 2 feet in diameter	3, 401. 13
Forks of road leading southwest down Wenas ridge, north side of road; nail in root of pine stump 2 feet in diameter	3, 497. 93
Wenas Creek and Naches River, 2 miles east of summit of upper pass between, 30 feet south of road at east end of open flat, between blazed pine trees, each 12 feet distant; iron post marked "3863 T."	3, 863. 194
Canyon into Naches River, on timber bench running along east side of, 12 feet west of road; nail in root of pine tree 2.5 feet in diameter	2, 696. 45
Naches River Valley, near Mehaffy's house, east of road; nail in root of pine tree	2, 567. 20
Mehaffy's ranch, 3 feet southwest of northwest corner of dwelling house, at junction of Naches and Wenas roads, ¾ mile northwest of upper ford of Naches River; iron post marked "2138 T."	2, 138. 754
Naches River, 40 feet south of first log cabin above upper ford, 60 feet south of road; nail in root of pine tree 12 inches in diameter	2, 081. 86
McDaniel's house, 600 feet east of, 75 feet north of road and 300 feet east of small stream crossing; nail in top of pine stump 4 inches in diameter cut close to ground	2, 005. 99
Schoolhouse, 600 feet northwest of, 75 feet south of fence corner, 8 feet east of road; nail in root of pine tree 6 feet in diameter	2, 019. 22
Old Nile post-office, west of Rattlesnake Creek, 100 feet north of, in sec. 3, T. 15 N., R. 15 E.; nail in root of cottonwood tree 8 inches in diameter.	1, 998. 55
Naches River, 15 feet southeast of south end of bridge over; in top of rock.	1, 948. 13
Farmhouse, 600 feet east of, north of road; in top of bowlder 2 feet in diameter	1, 936. 36
Steven's house, Buckeye ranch, opposite, in road; nail in root of stump 18 inches in diameter	1, 854. 64
Steven's house, Buckeye ranch, 3 feet west of gate to; 2 feet south of fence, 10 feet north of road, in sec. 12, T. 15 N., R. 15 E.; iron post, marked "1855 T."	1, 854. 564
Horseshoe bend, west end of; north bank of river, 6 feet east of blazed oak tree 14 inches in diameter; on point of rock	1, 714. 34
F. V. Hanson's house, 50 feet north of; at east end of grade over hill; nail in root of small cottonwood tree	1, 659. 22
F. V. Hansen's ranch, 125 feet north of house at west end of oak flat; east end of grade over hill, 75 feet south of cliff talus, in small point of outcropping ledge; bronze tablet, marked "1861 T."	1, 660. 824
Naches River, 30 feet northwest of at wing dam at head of Selah ditch, 500 feet south of house, 5 feet southeast of road and southeast of oak tree 2 feet in diameter; nail in top of oak stump 16 inches in diameter	1, 634. 28
Bluff running down to mouth of Tieton River, directly north of; nail in top of post brace near center of north side of flume of Selah ditch	1, 622. 04
Old Mill, above; in top of south end of plank bridge over Selah ditch	1, 620. 17
Meister's ranch, west of; top planking of bridge over Selah ditch at road crossing	1, 618. 16

	Feet.
Lamberson's ranch, inside fence; 4 feet west of gate to lane leading to house, 50 feet west of road crossing at Wapata ditch; iron post, marked "1568 T."	1,567.851
Lamberson's ranch, 50 feet east of lane to; in top planking at road crossing Wapata ditch	1,573.04
Lamberson's house, northeast of; nail in top of center of plank walk on flume over drainage under Selah ditch	1,616.45
Lane and poplar grove, north of; nail in post at east end of flume of Selah ditch	1,613.52
Naches Valley, north side of; 6 feet north of east end of bridge over Selah ditch; nail in south end of sunken log	1,612.72

NACHES RIVER, VIA TIETON RIVER, TO TOWNSHIP 14 NORTH, RANGE 15 EAST.

Naches River, 200 feet north of; 4 feet west of road to ford up Tieton River; on rock	1,597.86
Tieton River, mouth of; 15 feet east of road and 40 feet south of Naches River bank; on rock	1,600.20
Timm's ranch, 100 feet northeast of house; nail in top of triple oak stump	1,680.64
Timm's ranch, 3 feet north of southeast corner of stone foundation to milk house; iron post, marked "1681 T."	1,681.250
First ranch above Timm's ranch, 50 feet southeast of river at ford to; 3 feet from road, 10 feet northeast of foot of low bench; nail in root of hemlock 2 feet in diameter	1,746.96
Island, opposite foot of; at ford to second ranch above Timm's, 3 feet east of road; nail in top of low burnt stump	1,829.05
Tieton River, 300 feet north of; 60 feet east of fence, 100 feet south of base of cliff under high rock point; in triangular bowlder 7 feet in diameter	1,849.43
Harper's ranch, 35 feet south of trail; on point of rock bluff near extreme edge over river, opposite	1,959.59
Harper's ranch, ¾ mile west of; 1,000 feet west of west branch of dry water course from deep canyon to the north, 60 feet north of cleared field and 600 feet north of river, 9 feet south of 25-foot outcropping point at base of high rock cliff; iron post, marked "1958 T."	1,958.425

NACHES RIVER, VIA COWICHE AND ATANUM CREEKS, TO OLD YAKIMA.

Zirkle's ranch, in fenced inclosure 15 feet north of road; top of bowlder 5 feet in diameter	1,249.74
Small unpainted board shack south of road; 400 feet west of, 10 feet north of road; nail in root of small cottonwood tree	1,287.02
Cowiche Creek; 600 feet northwest of basalt cliff, 100 feet high, south of road; nail in east end of log supporting north end of bridge over	1,318.63
Cowiche Canyon, 1,800 feet east of west end of; south of road; on point of rock	1,451.45
Cowiche Canyon, west end of; 4 feet south of road and 15 feet south of south end of bridge over creek; on point of low rock ledge	1,464.52
Stevenson's house, 1,200 feet south of; west of road; rock point under wire fence	1,557.77
South Fork of Cowiche Creek, at road crossing near forks of creek; top of planking on bridge	1,565.95
North and South Forks of Cowiche Creek, 60 feet northeast of low point of divide between, outside of wire fence, 30 feet northwest of main road; iron post, marked "1570 T."	1,569.912

	Feet.
Splawn's house, 500 feet east of; 8 feet south of road in small group of trees; nail in root of cottonwood tree 6 inches in diameter	1, 644. 50
Old store, formerly the post-office; 300 feet west of junction with road south; nail in floor of northeast corner of porch	1, 707. 95
Oak Grove creamery, 10 feet west of gate to lane leading to; 3 feet south of fence; iron post, marked "1824 T."	1, 823. 289
Stroud's house, 60 feet east of third creek crossing above; 6 feet east of road in bend; nail in root of cottonwood tree 2 feet in diameter	2, 146. 77
McDaniels Canyon, 675 feet east of mouth of; 100 feet north of creek, 50 feet north of road, in face of outcropping lava formation at base of low basalt cliff; bronze tablet, marked "2204 T."	2, 203. 526
McDaniels Canyon, 40 feet southwest of mouth of; shallow dry drain, 150 feet south of road; nail in oak tree 2.5 feet in diameter	2, 222. 25
Road where it skirts edge of open hill, east of; nail in root of triple pines.	2, 347. 96
Cossier's house, .6 mile southwest of, south of road; nail in root of pine 2.5 feet in diameter	2, 492. 03
Christensen's ranch, 150 feet east of grade to; rock point midway between road and fence	2, 633. 29
Louis Christensen's ranch, 100 feet west of forks of main road with road to; 20 feet south of main road and 3 feet north of branch road, at forks of South Fork of Cowiche Creek, in northwest corner of sec. 18, T. 13 N., R. 16 E., on granite ledge; bronze tablet, marked "2632 T."	2, 631. 443
Swanson's house, 100 feet southwest of south gate to ranch; 10 feet west of road; nail in root of pine tree 2. 5 feet in diameter	2, 882. 29
Sawmill, 15 feet west of house at; 30 feet south of mill pond, south of road; nail in root of pine stump 2.5 feet in diameter	3, 085. 85
Sawmill, ¾ mile west of hill, ⅛ mile from foot of; southeast of old trail in draw; nail in root of pine tree 3 feet in diameter	3, 340. 03
Cowiche and Atanum creeks, summit of pass between; ¾ mile from Cowiche Creek, in shallow sag at head of draw, ¾ mile above sawmill; blazed pines are east, south, and west; iron post, marked "3686 T."	3, 685. 028
Nasty Creek, at head of draw running southeast into; nail in west root of pine 2.5 feet in diameter, standing alone in open, rocky slope	3, 455. 19
Nasty Creek, on hill above; 250 feet south of outcropping ledge, north of old road; nail in root of leaning pine 2½ feet in diameter	3, 125. 04
Nasty Creek, 10 feet east of Corduroy bridge; pointed rock in road	3, 060. 68
Nasty Creek Canyon, mouth of; 35 feet south of Atanum Creek road, 20 feet north of barnyard fence on Hinkle ranch; on top of bowlder 2 feet in diameter	2, 467. 63
Nasty Creek, in top of planking of Atanum Creek road crossing over dry bed of	2, 468. 20
Hinkle ranch, opposite house, northeast side of road and 3 feet from fence; 300 feet southeast of Nasty Creek road crossing; iron post, marked "2463 T."	2, 461. 862
Hop kiln, 300 feet east of; north of road; nail in root of 3-foot stump	2, 313. 21
Rough-board house, 200 feet northeast of; in top planking of bridge over Atanum Creek	2, 263. 09
Anderson's house, 600 feet west of; at road crossing; in top planking of bridge over Atanum Creek	2, 247. 51
Anderson's house, 500 feet northwest of; in sec. 12, T. 12 N., R. 15 E., 25 feet north of road; nail in root of large lone pine	2, 240. 64
Old Tampico store, 300 feet north of; 75 feet north of deserted house used as stable and just inside of fence; nail in top of cottonwood stump 1 foot in diameter	2, 124. 69

	Feet.
Old Tampico store, 100 feet east of; at forks of road to north and south and at forks of Atanum Creek, south side of main road, 2 feet north of fence and 6 feet east of fence corner; iron post, marked "2116 T"	2,115.878
Knox house, tack-point peg under fifth fence post east of gate to	2,029.83
Edgerton house, east of gate to; south of road; tack-point peg 3 feet west of third fence post	1,942.72
Slavin's house, ¼ mile east of; 3 feet north of road at bend of creek to road; rock point at foot of columnar basalt cliff	1,848.95
A. Herke ranch, 100 feet northeast of house, 100 feet southwest of hop kiln south of road, in sec. 14, T. 12 N., R. 16 E.; nail in root of cottonwood tree 14 inches in diameter	1,791.95
Township line between Rs. 16 and 17 E., 930 feet east of; 30 feet north of road, 9 feet west of wire-fence corner; iron post, marked "1692 T"	1,691.703
Ashball house, east side of road to; just inside of fence corner; tack-point peg 8 feet north of small locust tree	1,590.12
House and hop kiln in sec. 12, at junction with road south to; rock point south of road	1,519.88
Schoolhouse, 300 feet southeast of; in sec. 10, T. 12 N., R. 17 E., at road corner; tack-point peg under first post east of fence corner	1,466.36
Schoolhouse, 275 feet southeast of; in sec. 10, T. 12 N., R. 17 E., 3 feet inside corner of wire fence on northeast corner of crossroads; iron post, marked "1469 T"	1,468.211
Atanum post-office, 500 feet west of; in top planking of bridge over irrigating ditch	1,252.78
Atanum post-office, at southwest corner of porch in front of; point of rock foundation	1,252.17
Atanum post-office, ½ mile east of; in top planking over irrigating ditch	1,217.76
Schoolhouse, 400 feet east of; in sec. 3, T. 12 N., R. 18 E., at west end of drain 4 feet wide over small irrigating ditch; nail in top of south end of side timber	1,061.80
Schoolhouse, 600 feet southeast of; in sec. 3, T. 12 N., R. 18 E., 45 feet north of road in jog of fence; iron post, marked "1066 T"	1,065.744
Section line between secs. 1 and 2, T. 12 N., R. 18 E., opposite center of; tack-point under wire fence	1,008.28

OKANOGAN COUNTY.

METHOW QUADRANGLE.

The elevations in the following list are based primarily upon the United States Geological Survey datum at Tacoma through the work of preceding seasons, but the levels started directly from an iron post in Captain Johnson's yard at Lakeside, the elevation of which was accepted as being 1,090.782 feet above mean sea level. Starting thus at the foot of Lake Chelan a line of levels was run to Methow River, up Methow River to the mouth of Twisp River, up Twisp River to the summit, thence down Bridge Creek to Stehekin River, whence a connection was made through levels previously run with the head of Lake Chelan. The length of the line was about 202 miles.

The elevations of the water surface with reference to bench marks at the foot and head of the lake were determined on two separate days, the result indicating that the surface at the head of the lake was 0.869

feet higher than the surface at the foot of the lake, the length of the lake being about 70 miles.

It was not practicable to close a circuit with these levels, so they are given as they were determined without check. The proposition was considered of adjusting them on the basis of the lake being level, but that was abandoned.

The leveling was done under the general direction of Mr. R. A. Farmer, topographer, by Mr. E. M. Fry, levelman.

LAKESIDE, OVER STATE ROAD, TO METHOW POST-OFFICE.

	Feet.
Lakeside, at wharf in front of Lakeview Hotel; water level in Lake Chelan at 3 p. m., June 8, 1899	1,080.3
Lakeside, in porch at northwest corner of building occupied by Hardenberg & Fasdick; top of nail	1,088.25
Chelan, ½ mile west of; 50 feet west of south end of bridge over Chelan River; top of bowlder	1,088.54
Chelan, ¼ mile west of; nail in step of log church	1,119.48
Chelan, 3¼ miles north of; ¼ mile north of Wilson ranch house, 15 feet west of road; iron post, marked "1417 T"	1,417.009
Mackerson's ranch, in front of gate to; road	1,266.00
Chelan, 6 miles north of; on stone in center of road	1,269.46
Johnson's ranch, northeast corner of; on stone 200 feet west of road and south side of drain	1,330.59
Johnson's ranch, 1 mile north of; top of stone on east side of road	1,359.19
Antoine's ranch, 1 mile south of; 25 feet east of road, 500 feet north of milepost 48; iron post, marked "1361 T"	1,360.998
Willis's ranch, 300 feet south of and 50 feet east of northeast corner of fence; highest point of stone at side of road	1,459.64
McCarty's ranch, ½ mile north of; 100 feet east of State road, on highest point; on stone set for ¼ corner of township line	1,424.91
Alter Lake, 300 feet south of; 100 feet west of road, 1,000 feet west of McCutchin's ranch house; iron post, marked "1201 T"	1,201.016
Methow River, 1 mile from; 50 feet west of road, on summit of hill south of Methow Valley; nail in root of pine tree 20 inches in diameter	1,220.00
Methow River, ½ mile from; at intersection of road up Methow and road to Ives Landing; on top of stone	1,027.63
Vroman's ranch, in front of; 200 feet southeast of house, 200 feet east of shop, and 100 feet north of State road; iron post, marked "1042 T"	1,036.29
McCarty's ranch, 200 feet east of; 10 feet west of road; nail in root of pine tree	1,061.41
Black Canyon Creek	1,035.00
Squaw Creek, 150 feet east of; 50 feet south of road; top of bowlder	1,067.99
Squaw Creek, 1 mile north of; 10 feet east of road at southwest corner of Noyes's ranch; top of bowlder	1,055.20
Methow post-office; at southeast corner of Bolinger's store, 10 feet west of State road; iron post, marked "1158 T"	1,157.562

METHOW POST-OFFICE TO TWISP.

McFarland Creek, 100 feet east of; east side of road; top of large bowlder	1,253.29
Gold Creek, 1 mile south of; 150 feet west of road; top of stone	1,318.46
Gold Creek, 1,000 feet north of; east side of road; top of stone	1,323.78
Gold Creek, ½ mile north of; on top of high flat; surface of road	1,503

	Feet.
Peterson's ranch; 300 feet south of gate and 300 feet southwest of barn; on top of stone	1,358.48
Libby Creek, 100 feet north of; 10 feet east of road, 100 feet north of bridge; on top of stone	1,377.22
Ferris's ranch; 100 feet west of house, 250 feet northeast of barn, east side of road; iron post, marked "1452 T"	1,451.949
Ferris's ranch, 1 mile north of; 20 feet west of road; on top of stone	1,452.19
Ferris's ranch, 2 miles north of; 50 feet east of road, 1,000 feet west of Methow River; on top of stone	1,483.06
Ferris's ranch, 3 miles north of; 150 feet west of road, at point 1,000 feet north of north end of lane; on top of stone	1,546.03
Alder Creek crossing, ¼ mile south of; 10 feet west of road; nail in root of pine tree	1,810.05
Cushing's ranch house, 150 feet northwest of; 10 feet east of road; on top of stone	1,826.04
Twisp, 2 miles south of, on east side of road at north end of small lake; on top of stone	1,806.73
Twisp, at northeast corner of Caldwell's blacksmith shop, 300 feet southwest of post-office; iron post, marked "1619 T"	1,618.518

TWISP, VIA TWISP PASS, TO MOUTH OF BRIDGE CREEK.

Twisp, 1½ miles west of, 100 feet north of north end of bridge over Twisp River; nail in top of stump	1,666.10
Twisp, 3 miles west of, nail in floor of porch of J. L. Caldwell's house	1,866.17
Twisp, 4¾ miles west of, 10 feet east of road; nail in top of stake	1,988.56
Elbow Coulee, mouth of, 10 feet north of road at S. M. Newby's ranch; iron post, marked "1994 T"	1,993.695
Newby's ranch, 1 mile west of, 4 feet south of road, at foot of pine tree; on top of bowlder	2,025.00
Newby's ranch, 2 miles west of, 10 feet south of road; on top of stone	2,091.46
Newby's ranch, 4.5 miles west of, 500 feet north of cabin, on north side of road; nail in root of tree 12 inches in diameter	2,221.16
Old Scaffold camp ground, at south side of road; iron post, marked "2329 T"	2,328.637
Old Scaffold camp ground, 1 mile west of, at south side of road; on top of stone	2,395.94
War Creek, 1 mile west of mouth of; on top of stone in center of road	2,459.43
War Creek, 3 miles west of mouth of, 20 feet south of road at foot of pine tree; on top of stone	2,667.34
War Creek, 4 miles west of mouth of; nail in top of stump in center of road	2,798.83
Gilbert Camp, 8 miles east of, 10 feet south of road; iron post, marked "2806 T"	2,805.840
South Creek, 3 miles east of crossing; nail in top of stump in center of road	2,889.81
South Creek crossing, 300 feet west of, south side of road; nail in root of fir tree	3,119.85
South Creek, 2 miles west of; nail in stump in center of road	3,378.28
Gilbert Camp, 50 feet east of assay office, south side of street; iron post, marked "3527 T"	3,527.337
Gilbert, 1.5 miles west of, south side of trail; on top of large bowlder	3,951.03
Gilbert, 2 miles west of, north side of trail, at foot of fir tree 45 inches in diameter; on top of stone	4,251.68

	Feet.
Gilbert, 3 miles west of, 4 feet east of north end of bridge over Twisp River; + on top of large flat bowlder	4,484.84
Gilbert, 4 miles west of, north side of trail; on top of stone	5,006.91
Twisp Pass, summit of, 10 feet south of trail; iron post, marked "6066 T"	6,066.094
Twisp Pass, 2½ miles west of, south side of trail; on top of stone	5,063.55
Twisp Pass, 5 miles west of, 5 feet south of trail; nail in root of tree	3,802.52
Bridge Creek, center of new bridge over	3,625.00
Twisp Pass, 11 miles west of, west side of trail; on top of stone	3,473.76
Twisp Pass, 12 miles west of, ¼ mile east of Maple Creek, south side of trail; nail in root of tree	3,190.10
Bridge Creek, ½ mile east of mouth of, 10 feet south of trail; nail in root of cedar tree 6.5 feet diameter	2,556.20
Bridge Creek, mouth of, 225 feet south of new bridge; nail in root of fir tree 2.5 feet diametet	2,174.48

TWISP, VIA STATE ROAD, TO SCHUMBER'S RANCH.

Twisp River, water level	1,598.00
Twisp, 1 mile north of, 150 feet east of road, 400 feet west Methow River; on stone	1,677.71
Twisp, 2 miles north of, 100 feet west of road; top of stone	1,802.69
Twisp, 3 miles north of, 150 feet east of road; top of stone set for ¼ section corner	1,819.67
Twisp, 4 miles north of, 200 feet south of Hartle ranch house, 150 feet west of road; iron post, marked "1688 T"	1,687.553
Twisp, 6 miles north of, 50 feet west of road; on top of stone	1,749.85
Twisp, 7 miles north of, 100 feet east of road; on top of stone	1,746.72
Winthrop, ½ mile west of, south side of road; on stone	1,803.10
Schumber's ranch, 800 feet north of house, 150 feet west of road; nail in root of pine tree	1,796.07
Schumber's ranch, 1 mile north of, 150 feet west of road, 300 feet from Methow River; nail in root of pine tree	1,811.21
Methow River, water surface	1,787.

WINTHROP TO SLATE CREEK PASS.

Winthrop, at town pump, 100 feet south of Methow Trading Company's store and 100 feet north of hotel; iron post, marked "1765 T"	1,765.159
Winthrop, 1 mile north of, east side of road; on stone	1,811.21
Winthrop, 5 miles north of; nail in top of milepost 17	1,911.14
Winthrop; nail in top of milepost 16	1,899.74
Winthrop; nail in top of milepost 15	1,980.74
Winthrop; nail in top of milepost 14	1,953.43
Milepost 13, nail in top of	1,973.06
Milepost 11, nail in top of	2,064.10
Milepost 10, nail in top of	2,108.81
Milepost 8, about 3,000 feet west of, 27 feet northwest of a fir tree and 30 feet south of a fir tree, 5 feet south of road, in stone; aluminum bolt, marked "2165 T"	2,165.221
Robinson Creek, 6 miles south of; nail in top of milepost 6	2,206.52
Robinson Creek, 4 miles south of; nail in top of milepost 4	2,289.00
Robinson Creek, 3 miles south of, 400 feet north of milepost 3; nail in root of pine tree 12 inches diameter	2,374.28
Ventura, road	2,405.00
Robinson Creek, 2 miles south of, 5 feet west of milepost 2; top of stone	2,420.10

	Feet.
Robinson Creek, 4 feet east of southeast corner of Methow Trading Company's warehouse, in stone; aluminum bolt, marked "2521 T"	2,521.268
Eureka Camp house, at door; on rock	2,615.96
Robinson Creek, 2.5 miles north of, north side of trail; on top of stone	2,713.22
Slate Creek Pass, summit of, 10 feet south of trail, 4 miles south of Slate Creek camp; bolt in top of large stone	6,197.31

MOUTH OF LIBBY CREEK TO TWISP.

Libby Creek, 100 feet north of bridge, east of road; on top of stone	1,377.22
Libby Creek, ¼ mile west of bridge, 10 feet north of road in big flat; on large rock	1,543.00
Sawmill, 50 feet southeast of; nail in pine stump	1,766.57
Libby Creek bridge, 200 yards west of sawmill	1,760.01
Smith's house, 300 feet north of; nail in top of stump	1,966.31
Junction of roads; nail in top of stump	2,137.59
C. Smith's ranch, at center of west fence, 100 feet west of trail; on highest point of large bowlder	2,826.20
Summit of pass between Libby Creek and Twisp Creek, on west side of trail; on top of rock 4 by 5 by 9 feet	3,533.64
Burgar's ranch, 1 mile south of house, east side of trail; on top of stone	2,500.07
Twisp, 1 mile southwest of, east side of trail; on top of stone	2,199.13

NEWBY'S RANCH, UP ELBOW COULEE, TO SCHUMBER'S.

Newby's ranch, 1 mile north of, 200 feet west of trail; on top of stone	2,331.00
Summit between Elbow Coulee and Rader Lake, 50 feet east of trail; on top of white rock	2,629.32
Rader Lake, water surface	2,193.00
Rader Lake, ¼ mile south of, south of Rader's ranch; on top of stone in road	2,184.43
Rader's ranch, 2.5 miles east of, 100 feet east of road; top of nail in root of tree	1,960.12

WINTHROP, UP BEAR CREEK, TO MOUTH OF PIPESTONE CANYON.

Winthrop, 2 miles south of, intersection of road up Bear Creek with road from Winthrop to Silver; on top of stone	1,818.67
Winthrop, 4 miles southeast of; ½ mile southwest of mouth of Pipestone Canyon, 1,000 feet north of cabin, south side of trail; iron post, marked "2398 T"	2,398.358

SILVER TO RED SHIRT STAMP MILL.

Silver, 25 feet south of southeast corner of post-office, west side of street; iron post, marked "1513 T"	1,512.662
Silver, 1 mile north of, 250 feet southwest of schoolhouse; 50 feet west of road; nail in root of double pine tree	1,556.38
Silver, 4 miles northeast of, 500 feet northwest of Red Shirt Mining and Milling Company's stamp mill, 100 feet south of Beaver Creek, north side of road; iron post, marked "1912 T"	1,911.535

UP LIBBY CREEK TO J. E. SMITH'S RANCH.

J. E. Smith's ranch, 100 feet west of where trail up Libby Creek enters ranch; iron post, marked "2500 T"	2,500.333

UP M'FARLAND CREEK TO LAMBERT'S RANCH.

	Feet.
Lambert's ranch, 25 feet west of gate, 10 feet east of trail, 4 miles up McFarland creek; iron post, marked "2282 T"	2,282.155

UP SQUAW CREEK TO SQUAW CREEK CAMP.

Squaw Creek Camp, 1 mile north of, 3 miles from mouth of Squaw Creek, 8 feet north of road; iron post, marked "1983 T"	1,983.371

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[Twenty-first Annual Report.]

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Under the law a copy of each folio is sent to certain public libraries and educational institutions. The remainder are sold at 25 cents each, except such as contain an unusual amount of matter, which are priced accordingly. Prepayment is obligatory. The folios ready for distribution are here listed:

No.	Name of sheet.	State.	Limiting meridians.	Limiting parallels.	Area, in square miles.	Price, in cents.
1	Livingston	Montana	110°–111°	45°–46°	3,354	25
2	Ringgold	Georgia Tennessee	85°–85° 30′	34° 30′–35°	980	25
3	Placerville	California	120° 30′–121°	38° 30′–39°	932	25
4	Kingston *a*	Tennessee	84° 30′–85°	35° 30′–36°	969	25
5	Sacramento	California	121°–121° 30′	38° 30′–39°	932	25
6	Chattanooga	Tennessee	85°–85° 30′	35°–35° 30′	975	25
7	Pikes Peak *a*	Colorado	105°–105° 30′	38° 30′–39°	932	25
8	Sewanee	Tennessee	85° 30′–86°	35°–35° 30′	975	25
9	Anthracite-Crested Butte.	Colorado	106° 45′–107° 15′	38° 45′–39°	465	50
10	Harpers Ferry	Virginia West Va Maryland	77° 30′–78°	39°–39° 30′	925	25
11	Jackson	California	120° 30′–121°	38°–38° 30′	938	25
12	Estillville	Virginia Kentucky Tennessee	82° 30′–83°	36° 30′–37°	957	25
13	Fredericksburg	Maryland Virginia	77°–77° 30′	38°–38° 30′	938	25
14	Staunton	Virginia West Va	79°–79° 30′	38°–38° 30′	938	25
15	Lassen Peak	California	121°–122°	40°–41°	3,634	25
16	Knoxville	Tennessee N. Carolina	83° 30′–84°	35° 30′–36°	925	25
17	Marysville	California	121° 30′–122°	39°–39° 30′	925	25
18	Smartsville	California	121°–121° 30′	39°–39° 30′	925	25
19	Stevenson	Alabama Georgia Tennessee	85° 30′–86°	34° 30′–35°	980	25
20	Cleveland	Tennessee	84° 30′–85°	35°–35° 30′	975	25
21	Pikeville	Tennessee	85°–85° 30′	35° 30′–36°	969	25
22	McMinnville	Tennessee	85° 30′–86°	35° 30′–36°	969	25
23	Nomini	Maryland Virginia	76° 30′–77°	38°–38° 30′	938	25
24	Three Forks	Montana	111°–112°	45°–46°	3,354	50
25	London	Tennessee	84°–84° 30′	35° 30′–36°	969	25
26	Pocahontas	Virginia West Va	81°–81° 30′	37°–37° 30′	951	25
27	Morristown	Tennessee	83°–83° 30′	36°–36° 30′	963	25
28	Piedmont	Maryland West Va	79°–79° 30′	39°–39° 30′	925	25
29	Nevada City:					
	Nevada City	California	121° 00′ 25″–121° 03′ 45″	39° 13′ 50″–39° 17′ 16″	11.65	50
	Grass Valley		121° 01′ 35″–121° 05′ 04″	39° 10′ 22″–39° 13′ 50″	12.09	
	Banner Hill		120° 57′ 05″–121° 00′ 25″	39° 13′ 50″–39° 17′ 16″	11.65	
30	Yellowstone National Park:					
	Gallatin	Wyoming	110°–111°	44°–45°	3,412	75
	Canyon					
	Shoshone					
	Lake					
31	Pyramid Peak	California	120°–120° 30′	44°–45°	932	25
32	Franklin	Virginia West Va	79°–79° 30′	38° 30′–39°	932	25
33	Briceville	Tennessee	84°–84° 30′	36°–36° 30′	963	25
34	Buckhannon	West Va	80°–80° 30′	38° 30′–39°	932	25
35	Gadsden	Alabama	86°–86° 30′	34°–34° 30′	986	25
36	Pueblo	Colorado	104° 30′–105°	38°–38° 30′	938	50
37	Downieville	California	120° 30′–121°	39° 30′–40°	919	25
38	Butte Special	Montana	112° 29′ 30″–112° 36′ 42″	45° 59′ 28″–46° 02′ 54″	22.80	50
39	Truckee	California	120°–120° 30′	39°–39° 30′	925	25
40	Wartburg	Tennessee	84° 30′–85°	36°–36° 30′	963	25
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42	Nueces	Texas	100°–100° 30′	29° 30′–30°	1,035	25
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46	Richmond	Kentucky	84°–84° 30′	37° 30′–38°	944	25
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a Out of stock

No.	Name of sheet.	State.	Limiting meridians.	Limiting parallels.	Area, in square miles.	Price, in cents.
50	Holyoke	Mass. Conn	72° 30′–73°	42°–42° 30′	885	50
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55	Fort Benton	Montana	110°–111°	47°–48°	3,273	25
56	Little Belt Mts.	Montana	110°–111°	46°–47°	3,295	25
57	Telluride	Colorado	107° 45′–108°	37° 45′–38°	236	25
58	Elmoro	Colorado	104°–104° 30′	37°–37° 30′	950	25
59	Bristol	Virginia Tennessee	82°–82° 30′	36° 30′–37°	957	25
61	Monterey	Virginia West Va.	79° 30′–80°	38°–38° 30′	938	25
62	Menominee Special	Michigan	87° 44′–88° 09′	45° 44′–45° 55′	254	25
63	Mother Lode	California	(a NW.-SE. rectangle,	70 m. long, 6¼ wide)	455	50
64	Uvalde	Texas	99° 30′–100°	29°–29° 30′	1,040	25
65	Tintic Special	Utah	111° 55′–112° 10′	39° 45–40°	229	25

STATISTICAL PAPERS.

Mineral Resources of the United States, 1882, by Albert Williams, jr. 1883. 8°. xvii, 813 pp. Price 5 cents.

Mineral Resources of the United States, 1883 and 1884, by Albert Williams, jr. 1885. 8°. xiv, 1016 pp. Price 60 cents.

Mineral Resources of the United States, 1885. Division of Mining Statistics and Technology. 1886. 8°. vii, 576 pp. Price 40 cents.

Mineral Resources of the United States, 1886, by David T. Day. 1887. 8°. viii, 813 pp. Price 50 cents.

Mineral Resources of the United States, 1887, by David T. Day. 1888. 8°. vii, 832 pp. Price 50 cents.

Mineral Resources of the United States, 1888, by David T. Day. 1890. 8°. vii, 652 pp. Price 50 cents.

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Mineral Resources of the United States, 1892, by David T. Day. 1893. 8°. vii, 850 pp. Price 50 cents.

Mineral Resources of the United States, 1893, by David T. Day. 1894. 8°. viii, 810 pp. Price 50 cents.

On March 2, 1895, the following provision was included in an act of Congress:

"*Provided*, That hereafter the report of the mineral resources of the United States shall be issued as a part of the report of the Director of the Geological Survey."

In compliance with this legislation the following reports have been published:

Mineral Resources of the United States, 1894, David T. Day, Chief of Division. 1895. 8°. xv, 646 pp., 23 pl.; xix, 735 pp., 6 pl. Being Parts III and IV of the Sixteenth Annual Report.

Mineral Resources of the United States, 1895, David T. Day, Chief of Division. 1896. 8°. xxiii, 542 pp., 8 pl. and maps; iii, 543–1058 pp., 9–13 pl. Being Part III (in 2 vols.) of the Seventeenth Annual Report.

Mineral Resources of the United States, 1896, David T. Day, Chief of Division. 1897. 8°. xii, 642 pp., 1 pl.; 643–1400 pp. Being Part V (in 2 vols.) of the Eighteenth Annual Report.

Mineral Resources of the United States, 1897, David T. Day, Chief of Division. 1898. 8°. viii, 651 pp., 11 pl.; viii, 706 pp. Being Part VI (in 2 vols.) of the Nineteenth Annual Report.

Mineral Resources of the United States, 1898, by David T. Day, Chief of Division. 1899. 8°. viii, 616 pp.; ix, 804 pp., 1 pl. Being Part VI (in 2 vols.) of the Twentieth Annual Report.

The money received from the sale of the Survey publications is deposited in the Treasury, and the Secretary of the Treasury declines to receive bank checks, drafts, or postage stamps. All remittances, therefore, must be by MONEY ORDER, made payable to the Director of the United States Geological Survey, or in CURRENCY—the exact amount. Correspondence relating to the publications of the Survey should be addressed to—

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UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D. C.

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